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ABSTRACT

Inequities of access to health care and service provisions are considered to be major problems by health policy-makers today. These inequities result from disparities in physician distribution by specialty and geography that are concealed by aggregate analyses of physician supply. This paper describes what is presently known about physician supply and distribution and presents projections of the supply for physician specialists through 1990. Due to the potential for physician extenders to perform a significant role in health care delivery, the present supply of physician extenders, namely physician assistants and nurse practitioners, is described and supply projections are developed.

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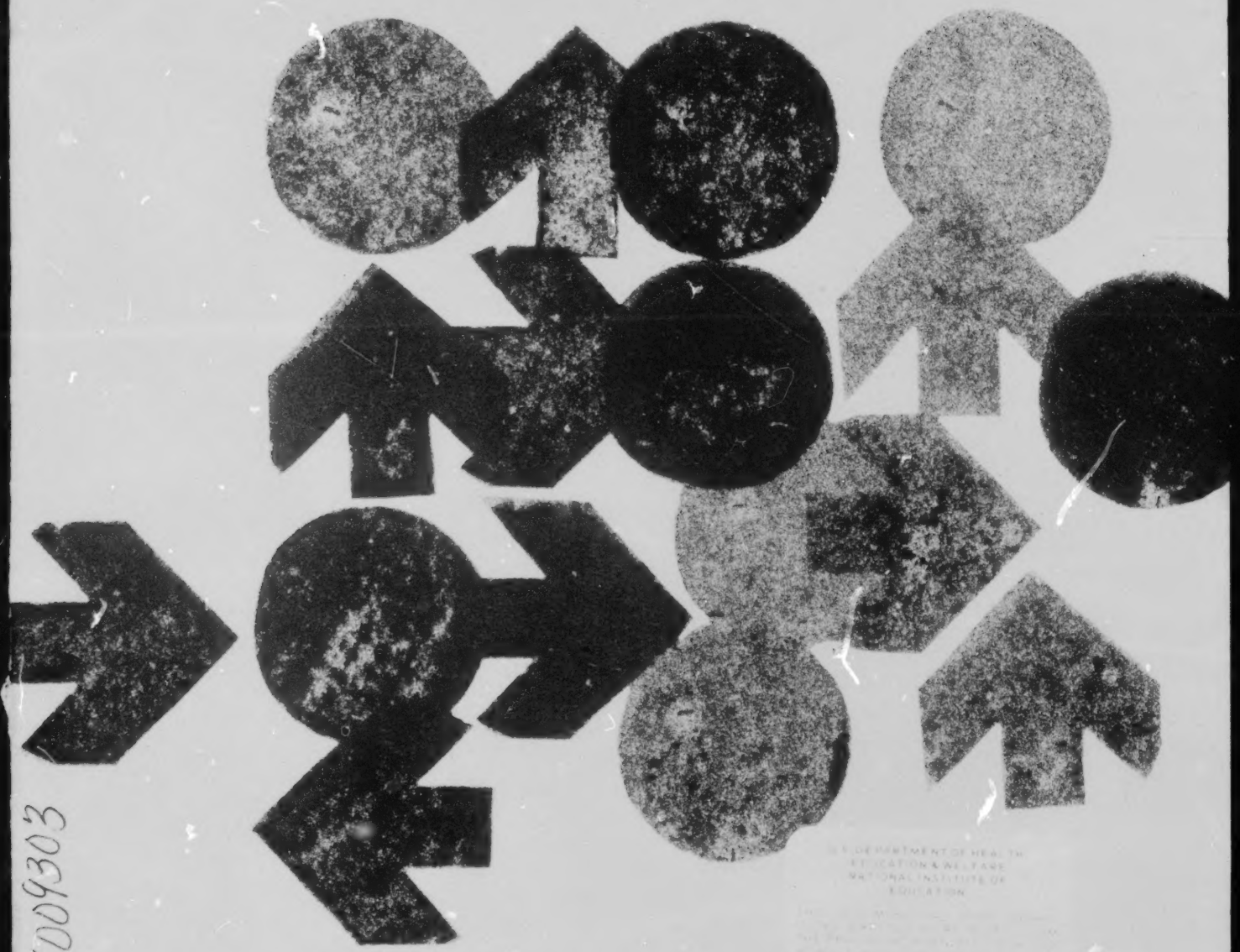
A Background Paper



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SUPPLY AND DISTRIBUTION OF PHYSICIANS AND PHYSICIAN EXTENDERS

A Background Paper Prepared for the
Graduate Medical Education National Advisory Committee

Manpower Supply and Utilization Branch
Division of Medicine
Bureau of Health Manpower
3/1/77

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PREFACE

Inequities of access to health care and service provision are considered to be major problems by health policy makers today. Originally it was thought that these inequities resulted from shortages of physician manpower. However, the persistence of consumer dissatisfaction despite the substantial increases in overall physician supply have made it apparent that these inequities are related to disparities in physician distribution by specialty and geography which are somewhat concealed by aggregate analyses of physician supply.

This paper will attempt to describe what is presently known about physician supply and distribution and will present projections of the supply for physician specialists through 1990. Due to the potential for physician extenders to perform a significant role in health care delivery, the present supply of physician extenders, namely physician assistants and nurse practititioners will also be described and supply projections developed.

While the description of the present supply of physicians should be relatively straightforward, it is nonetheless complicated by the fact that specialty definitions are not discrete and relevant data are either not available or suffer from being somewhat inaccurate, inaccessible or incomplete. Estimates of the future supply of physician specialists and physician extender manpower are more difficult because of the uncertainties involved in estimating future changes in productivity and task delegation patterns, as well as potential changes in national policy with respect to the support of graduate medical education and the influx of foreign medical graduates.

PRESENT PHYSICIAN SUPPLY

Introduction

The identification and classification of physician specialists is done according to several different methods, each of which has its inherent advantages and disadvantages. These various methods are based upon self-designation of specialty, State licensure data, board certification status and specialty society membership. Depending upon the method used, different numbers of physicians by specialty will be expressed. A more important aspect of supply is the actual productivity of physician specialists and the quantities of medical and surgical services rendered by them. At present, specialists and specialty services are not synonomous, because there are many overlaps in the provision of services both among specialists and between specialists and mid-level health practitioners.

Data Sources

The major sources of data on physician manpower are the American Medical Association (AMA) and the American Osteopathic Association (AOA) master files, the AMA and AOA board certification data, licensure data, and specialty society membership data. Descriptions of these data sources, along with their inherent assets and limitations are displayed in Table 1. Comparative studies of the available data sources by individual specialties and States have shown the AMA and the AOA data to be the most complete and accurate.(1/)(2/)(3/) Therefore, these sources will be used as a basis for this discussion of physician supply.

Total Physician Supply - 1974

According to the AMA and AOA files there were approximately 330,226 active M.D.s and 13,551 active D.O.s as of December 31, 1974. They were distributed among the specialties as displayed in Table 2.(4/)(5/) The distribution for osteopathic physicians should be viewed with caution since it is based on adjustments to the 1971 specialty distribution, the last year in which a census was done.(6/)(7/)

(1/) American Academy of Dermatology, Planning for Specialty Care: An Evaluation of the AMA Physician Data, 1976.
(2/) American College of Cardiology, Evaluation of Cardiology Manpower and and Training Requirements, 1974.
(3/) Cherkin, D. & Lawrence, D., One State's Experience, School of Public Health, University of Washington, Seattle, Washington, 1976.
(4/) Roback, G., and Mason H.R., Physician Distribution and Medical Licensure in the U.S. 1974, Chicago, American Medical Association, 1975.
(5/) 1974 Directory, American Osteopathic Association, Chicago.
(6/) Altenderfer, M.E., Osteopathic Physicians in the U.S., Report of a 1971 Survey. BHRD, DHEW Publication No. (HRA)76-60, 1975.
(7/) Gevetz, N., Osteopathic Manpower Information Sheet

TABLE 1

Data Sources on Physician Specialty Supply

Data Sources	Assets	Limitations
1. The American Medical Association Master File. Contains data on all known M.D.s in the United States, obtained by surveys performed every three to four years and updated annually by selected mailings to specific physicians for whom a change in status has been indicated. 1/ Physicians are listed by self-designation as to their specialty, activity and location according to how they spend the majority of their time. 68 specialties are included within which 8 activity categories are included.	Most complete source of data on allopathic physicians. Published and updated annually providing trend data.	Self-designation of specialty gives no indication of specific training in the area and also tends to over-estimate specialty manpower, and underestimate general practice manpower. Published data provide no information on the time devoted to other specialty areas and activities making it difficult to determine full-time equivalent manpower. 2/ Accuracy of data on foreign medical graduates is debatable as is its accuracy of specialty distributions because increasing numbers of physicians are being relegated to the "non-classified" category. 3/ 4/ Can be difficult and/or expensive to obtain unpublished tabulations. Published data usually two years out of date.

TABLE 1 (con't)

Data Sources on Physician Specialty Supply

Data Sources	Assets	Limitations
2. The American Osteopathic Association Master File. Contains information on both member and non-member ostecpathic physicians as to location and updated annually. Augmented by surveys performed in 1956, 1967, and 1971 which yielded additional data on specialty, age and activity status. 5/	Most complete source of data on osteopathic physicians. Updated annually, and thus, only source of trend data on osteopathic physicians. In some cases the data are comparable to the AMA data.	The problems associated with self-designation relating to the AMA data also apply to the AOA data. Specialty data only available for survey years, and when published contain information at least three years out of date. Accuracy of specialty data questionable because large numbers of physicians are relegated to the non-classified category. 6/ Not always comparable to AMA data.
3. Licensure Data. Provides data on numbers of physicians licensed by State. Disaggregated by whether or not physician attended a U.S. or foreign medical school.	Contains data on physicians who have received licenses; therefore one can be sure all uncredentialled physicians are excluded. 7/ Published and updated annually, so trend data are available.	Underestimates true physician supply since it excludes all physicians who are not licensed, such as some of those in teaching and administration and research, and some FMGs who are providing important services despite their unlicensed status. No information on specialty and practice activities of licensed physicians. Duplication often occurs between various State licensure boards.

TABLE 1 (con't)

Data Sources on Physician Specialty Supply

Data Sources	Assets	Limitations
4. Board Certification Data. Gives information on the numbers of M.D.s certified by the 22 medical and surgical boards and the numbers of D.O.s certified by the 14 osteopathic specialty boards 8/	Most objective criteria of physicians' post-graduate training in specific specialty areas. Published and updated annually so trend data are available.	Excludes almost half of M.D. supply as reported by the AMA and 3/5 of the D.O. supply as reported by the AO[illegible] Duplicate counting occurs due to overlapping memberships in various specialty boards. Does not necessarily represent physician's present specialty activities.
5. Specialty Society Memberships. Includes numbers and distributions of M.D.s in over 130 specialty societies. 9/	Gives some indication of physician's interests in specific areas of medicine not revealed in other AMA specialty classification. Published and updated annually.	Gives no indication of physician's training or background in a specific specialty area represented by the society. Duplicate memberships often occur. Does not necessarily represent the present activities of the physician.

1/ American Medical Association Physician Master File. American Medical Association Chicago, Illinois 1975.

2/ For example, a physician may report his or her professional activities in a typical work week consisting of 30 hours of patient care and 20 hours of teaching and research, and in addition specialty activity is reported as 25 hours of internal medicine and 25 hours of dermatology. This precludes determination of number of FTE physicians in direct patient care.

3/ According to cohort study of physicians immigrating to the United States between 1961 and 1971 an estimated 33 percent of 27,710 immigrants in the cohort were not on the AMA Master File. Kleinman, J.C. Physician Manpower Data: The Case of the Missing Foreign Medical Graduates, Medical Care, 12: 906, 1974. Others believe that the AMA does account for all FMGs. Butler, I. and Schaffner, R. Foreign Medical Graduates and Equal Access to Medical Care, Medical Care, 9 (2): 136-43, March-April, 1974.

4/ From 258 in 1970 to 20,343 in 1974 for M.D.s, Roback, G. and Mason, H.R.: Physician Distribution and Medical Licensure in the U.S., 1974. Chicago, American Medical Association, 1975.

5/ 1974 Directory, American Osteopathic Association, Chicago, 1974.

6/ From 901 in 1971 to 11,584 D.O.s in 1974. Altenderfer, M.E. Osteopathic Physicians in the U.S. A Report of a 1971 Survey, BHRD, DHEW, Publication No. (HRA) 75-60, 1975 and American Osteopathic Association, 1974 Master File.

7/ At present it is estimated that there are about 40,000 physicians in the country who do not hold a regular State License. op. cit., Roback, G. and Mason, H.R.

8/ For M.D.s, Profile of Medical Practice 1975-1976, American Medical Association, Chicago, 1976, p. 87. For D.O.s see, Yearbook and Directory of Osteopathic Physicians, American Osteopathic Association, Chicago, 1976.

9/ In 1974, over 130 such societies existed, in which there were 342,090 members representing 104 percent of all active physicians during that year. Profile of Medical Practice 1975-1976, American Medical Association, Chicago, 1976.

TABLE 2

TOTAL ACTIVE AND PERCENT DISTRIBUTION OF PHYSICIANS
(M.D.s AND D.O.s) BY SPECIALTY, DECEMBER 1974

	M.D.s 1/		D.O.s 2/	
	Number	Percent	Number	Percent
Total Active	330,226	100.0	13,551	100.0
Primary Care	126,431	38.3	6,112	45.1
General and Family Practice	53,997	16.4	5,330	39.3
Internal Medicine	51,752	15.7	595	4.4
Pediatrics	20,682	6.3	187	1.4
Medical Specialties	17,485	5.3	-	-
Allergy	16,657	.5	-	-
Cardiovasular Disease	6,229	1.9	-	-
Dermatology	4,479	1.4	-	-
Gastroenterology	2,063	0.6	-	-
Pediatric Allergy	429	0.1	-	-
Pediatric Cardiology	534	0.2	-	-
Pulmonary Disease	2,094	0.6	-	-
Surgical Specialties	93,386	28.3	1,314	10.3
General Surgery	31,085	9.4	519	3.8
Neurological Surgery	2,859	0.9	-	-
Obstetrics - Gynecology	20,987	3.6	186	1.4
Ophthalmology	10,741	3.3	164	1.2
Orthopedic Surgery	10,985	3.3	159	1.2
Otolaryngology	5,588	1.7	-	-
Plastic Surgery	2,088	0.6	-	-
Colon and Rectal Surgery	662	0.2	-	-
Thoracic Surgery	1,925	0.6	-	-
Proctology	-	-	100	.7
Urology	6,466	2.0	-	-
All Other Surgery	-	-	186	1.4
Other Specialties	92,964	28.1	1,142	8.4
Aerospace Medicine	708	.2	-	-
Anesthesiology	12,484	3.8	372	2.7
Child Psychiatry	2,411	0.7	-	-
Neurology	3,839	0.3	-	-
Occupational Medicine	2,365	0.7	-	-
Pathology	11,591	3.5	164	1.2
Physical Medicine	1,610	0.5	-	-
Psychiatry	23,302	7.1	237	1.7
Public Health	3,453	1.0	-	-
Radiology	14,753	4.8	369	2.7
All Other and Unspecified	15,448	4.7	4,983	36.8

TABLE 2 (con't)

Source: Roback, G. and Mason, H.R., Physician Distribution and the Licensure in the U.S. 1974, Chicago, American Medical Association, 1975. Altenderfer, M.E., Osteopathic Physicians in the U.S.: A Report on a 1971 Survey, BHRD, DHEW Publication No. (HRA) 75-60, 1975.

1/ Excludes 21,614 inactive, 20,343 unclassified and 7,525 address unknown physicians.

2/ Based on adjustments to the 1971 supply by adding residents in training in osteopathic hospitals between 1972 and 1974, and subtracting losses due to deaths and retirements.

Primary Care Physician Supply (M.D.s)

"Primary Care" is an evolving concept of health services organization and provision in the United States. This concept means different things to different people, and several groups and a host of writers have attempted to define the concept. Unanimity of opinion is elusive, complicated by the difficulty of defining primary care physicians apart from primary care services and primary care problems. The definitional problem is further complicated because our health system is evolving, and it is difficult to understand in writings and reports whether the authors are describing primary care as it is today in this country, or as it is likely to evolve in the future through a laissez faire market system, or as the authors would hope to shape the system through legislation and other controls and incentives.

The Health Professions Educational Assistance Act of 1976 (P.L. 94-484) includes family medicine, general internal medicine and general pediatrics as primary care specialties. The following tables and narrative use this convention.

Between 1963 and 1974, growth among the specialties has varied, as shown in Table 3. Despite a 26 percent increase in total M.D.s between 1963 and 1974 (261,778 to 330,266) the most significant trend in M.D. specialty distribution has been the decline in numbers of physicians in general practice. However, since the AMA does not distinguish between general practice and family practice these numbers mask the significant growth of family practice which has resulted, in part, from considerable State and Federal backing since its inception in 1969. Today, three-fourths of the Nation's medical schools have departments or divisions of family practice and there are over 4,000 residents in training and 9,000 physicians who have been certified by the American Board of Family Practice.

Pediatricians and internists, also considered primary care physicians, have increased from 43,196 to 72,434, or from 16.5 percent to 22.0 percent of all active physicians in the same time period. When added to general practice, the primary care specialists showed an increase from 110,071 to 126,431, or from 56.1 to 58.1 per 100,000 population. In spite of the increase in pediatricians and internists, the proportion of all active M.D.s in primary care specialties has declined over the twelve years from 42.1 percent to 38.2 percent.(8/)(9/) Although omitted from primary care in many analyses and in the manpower legislation, obstetricians and gynecologists are becoming more involved in primary care, with about 80 percent of their ambulatory patient visits reflecting problems seen also by other primary care physicians.(10/)(11/)

(8/) Op. cit., Roback, G., and Mason, H.R.
(9/) Roback, G., Distribution of Physicians in the U.S. 1963, American Medical Association, Chicago, 1964.
(10/) National Ambulatory Medical Care Survey, DHEW Publication No. (HRA)76-1772
(11/) National Disease and Therapeutic Index; Ambler, Pennsylvania, 1974.

TABLE 3

Trend in number of active physicians (M.D.), by specialty, percent distribution and physician per 100,000 population ratio. 1963, 1968 and 1974

Specialty	1963 Number	1963 Percent	1963 Phys/Pop	1968 Number	1968 Percent	1968 Phys/Pop	1974 Number	1974 Percent	1974 Phys/Pop
Total active M.D.s 1/	261,788	100.0	134.8	296,312	100.0	144.0	330,266	100.0	152.7
Primary care	110,071	42.1	56.7	116,760	39.4	56.7	126,431	38.2	58.5
General practice 2/	66,875	25.6	34.4	61,578	20.8	29.9	53,997	16.3	25.0
Internal medicine	30,434	11.6	15.7	38,532	13.0	18.7	51,752	15.7	23.9
Pediatrics	12,762	4.9	6.6	16,650	5.6	8.1	20,682	6.3	9.6
Other medical specialties	12,291	4.7	6.3	15,762	5.3	7.7	17,485	5.3	8.1
Allergy	1,414	0.5	0.7	1,661	0.6	0.8	1,657	0.5	0.8
Cardiovascular disease	3,928	1.5	2.0	5,602	1.9	2.7	6,229	1.9	2.9
Dermatology	3,156	1.2	1.6	3,775	1.3	1.8	4,479	1.4	2.1
Gastroenterology	1,198	0.5	0.6	1,748	0.6	0.8	2,063	0.6	1.0
Pediatric allergy	240	0.1	0.1	398	0.1	0.2	429	0.1	0.2
Pediatric cardiology	234	0.1	0.1	441	0.1	0.2	534	0.2	0.2
Pulmonary diseases	2,121	0.8	1.1	2,137	0.7	0.1	2,094	0.6	1.0
Surgical specialties	67,745	25.8	34.9	81,820	27.6	39.8	93,386	28.3	43.2
General surgery	23,607	9.0	12.2	28,433	9.6	13.8	31,085	9.4	14.4
Neurological surgery	1,818	0.7	0.9	2,419	0.8	1.2	2,859	0.9	1.3
Obstetrics, gynecology	15,296	5.8	7.9	18,017	6.1	8.8	20,987	6.4	9.7
Ophthalmology	7,833	3.0	4.0	9,368	3.2	4.6	10,741	3.3	5.0

TABLE 3 (con't)

Specialty	1963 Number	1963 Percent	1963 Phys/Pop	1968 Number	1968 Percent	1968 Phys/Pop	1974 Number	1974 Percent	1974 Phys/Pop
Orthopedic surgery	6,827	2.6	3.5	8,869	3.0	4.3	10,985	3.3	5.1
Otolaryngology	4,724	1.8	2.4	5,195	1.8	2.5	5,588	1.7	2.6
Plastic surgery	1,023	0.4	0.5	1,414	0.5	0.7	2,088	0.6	1.0
Colon and rectal surgery	740	0.3	0.4	707	0.2	0.3	662	0.2	0.3
Thoracic surgery	1,296	0.5	0.7	1,822	0.6	0.9	1,925	0.6	0.9
Urology	4,581	1.8	2.4	5,576	1.9	2.7	6,466	2.0	3.0
Other specialties	71,621	27.4	36.9	81,970	27.7	39.8	92,964	28.1	43.0
Aerospace medicine	1,554	0.6	0.8	1,456	0.5	0.7	708	0.2	0.3
Anesthesiology	7,593	2.9	3.9	10,112	3.4	4.9	12,484	3.8	5.8
Child psychiatry	751	0.3	0.4	1,702	0.6	0.8	2,411	0.7	1.1
Neurology	1,822	0.7	0.9	2,675	0.9	1.3	3,839	0.3	1.8
Occupational medicine	2,911	1.1	1.5	2,702	0.9	1.3	2,365	0.7	1.1
Pathology 3/	7,127	2.7	3.7	9,696	3.3	4.7	11,591	3.5	5.4
Physical medicine and rehabilitation	999	0.4	0.5	1,407	0.5	0.7	1,610	0.5	0.7
Psychiatry	15,551	5.9	8.0	19,907	6.7	9.7	23,302	7.1	10.8
Public health 4/	3,884	1.5	2.0	3,871	1.3	1.9	3,453	1.0	1.6
Radiology 5/	8,786	3.4	4.5	11,718	4.0	5.7	15,753	4.8	7.3
Other and unspecified	20,643	7.9	10.6	16,724	5.6	8.1	15,448	4.7	7.2

1/ Excludes physicians not classified: 1970-358, 1971-3,529, 1972-13,356, 1973-13,744, 1974-20,343.
2/ Includes family practice 1970-74.
3/ Includes forensic pathology.
4/ Includes general preventive medicine.
5/ Includes diagnostic and therapeutic radiology.

Source: Computed from numbers in Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association. Populations used include resident population in 50 States, D.C., Puerto Rico, and outlying areas and Armed Forces overseas as follows: 1963-194,189; 1964-196,858; 1965-199,278; 1966-201,585; 1967-203,704; 1968-205,758; 1969-207,863; 1970-209,539; 1971-211,578; 1972-212,971; 1973-214,573; 1974-216,282.

Note: Due to a change in the A.M.A. classification procedure in 1968, there exists a discontinuity in the figures published by the A.M.A. between those for 1963-67 and those for 1968-74. In this table the 1963-67 figures have been adjusted to provide a comparable series using data in: Theodore, C.N. et al. Reclassification of Physicians, 1968. Chicago, American Medical Association 1971.

Rates may not add to totals and subtotals due to independent rounding.

Some figures in this table differ from those presented in: The Supply of Health Manpower. 1970 Profiles and Projections to 1990. DHEW Pub. No. (HRA) 75-38. Washington, U.S. Government Printing Office, 1974.

The decline in primary care manpower and concomitant increase in non-primary care specialist manpower has been a source of major concern. The numbers themselves, however, are somewhat misleading because, as has already been stated, specialist manpower and specialist services are not synonymous. Non-primary care physicians, particularly in the medical subspecialties and in surgery are rendering varying proportions of care similar to that rendered by primary care physicians.(12/)(13/) Table 4 demonstrates these most frequently occurring diagnoses and the proportions treated by separate physician specialty groups. Other studies on non-primary care physicians have corroborated these findings.(14/)(15/) However, the magnitude of primary care delivered by non-primary care physicians is difficult to assess because it is difficult to adequately describe the nature of primary care.

One generally agreed upon definition of primary care is that developed by Alpert and Charney. According to this definition, the primary care physician should provide the initial contact or point of entry to the health care system for the patient, assume logitudinal responsibility regardless of the presence or absence of disease, and provide a broad integrationist function vis-a-vis the other health resources involved in the physical, psychological, and social aspects of the patient's care. On the basis of these criteria, Alpert and Charney judge family practice to completely satisfy the definition of primary medicine, with pediatrics and internal medicine doing so generally.(16/) Problems arise, however, in translating available classification schemas of physician visits, based upon diagnoses rendered, referral status and prior-visit status into quantifiable measures of primary care as described above. The ongoing Physician Practice Profile Study at the University of Southern California, which is categorizing patient care as (1) first encounter, (2) episodic encounter, (3) principal care encounter, (4) consultation encounter, (5) specialized care, and (6) continuous unlimited care encounter, will facilitate understanding of the nature and quantity of primary care services actually being delivered in a large number of different specialties.(17/)

Secondary and Tertiary Care Physician Supply (M.D.s)

As demonstrated in Table 3, small to moderate growth rates in the medical, surgical and other specialty groups have occurred between 1963 and 1974

(12/) Op. cit., National Ambulatory Medical Care Survey.
(13/) Op. cit., National Disease and Therapeutic Index, Ambler, PA, 1974.
(14/) Peterson, et. al., Review and Critique of Cardiology Manpower Study, American Journal of Cardiology, 37, May 1976, p. 959.
(15/) Rosenberg, C., How Much General Practice by Specialists? Medical Economics, September 15, 1975, p. 130.
(16/) Alpert, J., and Charney, E., The Education of Physicians for Primary Care, DHEW Publication No. (HRA)74-3113.
(17/) Mendenhall, R., Analysis and Validation of Effort Distribution of Physicians in Twenty-Four Specialties, University of Southern California, Los Angeles, California, 1977.

TABLE 4

Number and percent distribution of office visits by physician specialty, according to principal diagnosis: United States, May 1973-April 1974

Principal diagnosis classified by ICDA category 1/		Number of visits in thousands	Physician specialty			
			General practice	Medical specialties	Surgical specialties	Other specialties
			Percent distribution			
All diagnoses		644,893	40.4	26.3	28.5	4.9
Infective and parasitic diseases	000-136	25,233	35.2	35.9	17.1	-
Neoplasms	140-239	12,713	21.3	22.7	54.0	-
Endocrine, nutritional and metabolic diseases	240-279	26,099	58.2	30.0	10.3	-
Diabetes mellitus	250	8,904	55.2	34.6	-	-
Obesity	277	10,136	64.4	25.1	9.9	-
Mental disorders	290-315	29,064	25.2	15.9	4.7	54.2
Neuroses	300	16,570	29.9	18.2	-	48.0
Diseases of nervous system and sense organs	320-389	50,841	20.3	17.7	58.3	3.7
Diseases and conditions of the eye	360-379	15,248	11.3	-	82.7	-
Refractive errors	370	9,175	-	-	99.3	-
Otitis media	381	10,523	25.5	47.5	24.6	-
Diseases of circulatory system	390-458	59,240	50.0	37.1	9.8	3.1
Essential benign hypertension	401	22,752	54.0	35.2	8.2	-

Table 4 (Con't)

Principal diagnosis classified by ICDA category 1/		Number of visits in thousands	General practice	Physician specialty: Medical specialties	Physician specialty: Surgical specialties	Physician specialty: Other specialties
Diseases of respiratory system	460-519	97,383	49.9	36.0	12.1	2.0
Acute respiratory infections (except influenza)	460-466	50,859	57.9	29.1	10.9	2.1
Influenza	470-474	5,199	75.4	-	-	-
Hay fever	507	12,166	18.7	63.2	16.1	-
Diseases of digestive system	520-577	23,826	43.0	30.4	25.0	-
Diseases of genitourinary system	580-629	37,744	41.9	10.4	47.1	-
Diseases of male genital organs	600-607	3,596	45.6	-	47.0	-
Diseases of female genital organs	610-629	21,895	40.6	9.2	49.7	-
Diseases of skin and subcutaneous tissue	680-709	34,099	36.6	47.5	11.5	4.4
Diseases of musculoskeletal system	710-738	34,370	45.7	22.0	29.9	-
Arthritis and rheumatism	710-718	18,463	52.9	27.3	16.8	-
Symptoms and Ill-defined conditions	780-796	34,251	33.6	26.4	33.2	6.8
Accidents, poisoning, and violence	800-999	47,609	51.1	13.2	33.7	2.1
Fractures	800-829	7,984	40.3	-	54.3	-
Dislocation, sprain	830-848	15,408	53.8	10.6	32.2	-
Lacerations	870-907	9,131	58.4	17.3	24.1	-

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Table 4 (Con't)

Principal diagnosis classified by ICDA category 1/		Number of visits in thousands	General practice	Physician specialty: Medical specialties	Physician specialty: Surgical specialties	Physician specialty: Other specialties
Special conditions and examinations without illness	V00-V13	110,203	32.8	20.6	44.4	2.2
Medical and special exams	V00	39,613	39.1	39.7	18.9	-
Prenatal care	V06	25,359	30.5	-	67.1	-
Medical and surgical aftercare	V10	32,345	23.6	11.2	62.7	-
Other diagnoses 2/		8,630	42.1	27.3	29.8	-
Diagnosis given as "None"		8,019	37.3	27.0	33.4	-
Diagnosis unknown 3/		5,569	39.6	26.7	31.5	-

1/ Diagnostic groupings and code number inclusions are based on the *Eigth Revision International Classification of Diseases, Adapted for Use in the United States, 1965.*

2/ 280-289, Diseases of the blood and blood-forming organs; 630-678, Complications of pregnancy, childbirth, and the puerperium; 740-759, Congenital anomalies; 760-779, Certain causes of perinatal morbidity and mortality.

3/ Blank diagnosis; noncodable diagnosis; illegible diagnosis.

4/ These numbers are not available because they do not meet NCHS standards of reliability and precision.

Source: National Ambulatory Medical Care Survey, DHEW Publication No. (HRA) 76-1772, May 1976.

with a 13 percent increase in the medical specialty group compared to a 9.5 percent increase in surgery including obstetrics and gynecology and only a 7.5 percent increase for the other specialties.

Doctors of Osteopathy

Trend data on available D.O.s is difficult to compile due to large numbers of non-respondents in 1974 and the non-comparability of the 1974 data with previous data. Between 1957 and 1971, the only two years for which data on specialty supply are fairly accurate, the total number of osteopathic specialists declined 24 percent, from 9,620 to 7,290. At the same time, the number of D.O.s in primary care has declined both numerically and proportionally. These specialties, including general practice, internal medicine, manipulative therapy, and pediatrics, declined from 7,270 or 76.1 percent of the total to 4,494 or 63.5 percent of the total. The numbers in obstetrics have increased from 40 or 0.4 percent of the total to 90 or 1.2 percent of the total and the numbers in the surgical specialties increased significantly from 440 or 4.6 percent of the total to 750 or 10.6 percent of the total. The numbers in other specialties increased from 230 or 2.3 percent of the total to 670 or 9.5 percent of the total.(18/)

Women and Minorities in Medicine

The increasing numbers of physicians also include increasing representation of women. The number of active female M.D.s has increased over time, from 14,957 or 5.7 percent of the total in 1963 to 25,454 or 7.7 percent in 1974. Although women represented a little over half of the total U.S. population in 1970, there were only 21,800 active female M.D.s and D.O.s, or 6.7 percent of total active physicians. However, an increasing enrollment of women in medical and osteopathic schools will magnify their representation in the future. In 1969-1970, women made up 9.2 percent of the medical school entering class, while in 1973-1974, the figure was 19.6 percent. In terms of major specialty, the proportion of active women M.D.s in the primary care specialties declined from 46.3 percent to 43.1 percent between 1963 and 1973 compared with 41.6 percent and 45.0 percent respectively, for males.(19/)

Accompanying the growth in female representation has been a similar increase in minority representation in the profession over time. While minorities, including blacks, represented 17 percent of the total population in 1970, there were only 16,400 minority physicians representing 5 percent of the physician population.

More recent figures on active, patient care minority physicians are not available. Some indication of future representation may be gleaned from looking at trends in house staff representation by blacks. In 1970, there were 992 black house officers, or about 1.5 percent. In 1974,

(18/) Op. cit., Altenderfer, M.E.
(19/) Minorities and Women in the Health Fields, DHEW Publication No. (HRA)76-22, 1975.

there were 1,534 black house officers or about 2.5 percent. Looking further back into the physician pipeline, there were 3,706 minority students enrolled in U.S. medical schools in 1973-1974, or 7.4 percent of all enrollees; 5.9 percent were Afro-American, 1.0 percent Mexican-American and 1.8 percent Oriental-American. Thus, increasing enrollments of minorities in medical education will increase their representation in the total physician workforce.(20/)(21/)(22/)(23/)

Black M.D.s are not only under-represented in the profession but are concentrated in relatively few specialty areas. General and family practice, internal medicine, pediatrics, and obstetrics and gynecology combined represented nearly 60 percent of all black M.D.s in 1970, compared to 65 percent in 1967, proportions substantially higher than the national average. According to a survey of black M.D.s as of 1970, about one-fourth of active black M.D.s were engaged in general practice as a primary specialty compared to 1967, at which time the proportion was over one-third. An additional 13 percent of the respondents in the 1970 survey indicated internal medicine as a primary specialty, and 10 percent indicated general surgery. However, because the 1970 survey had a low response rate these numbers should be viewed with caution.(24/)(25/)

Foreign Medical Graduates

The proportion and role of foreign medical graduates has increased significantly during the past decade. In 1963, there were 31,000 foreign medical graduates in the United States or 11 percent of the total physician population. In 1974, the figure had increased to 77,000 FMGs or 20 percent of the total physician population. Furthermore, over 30 percent of all interns and residents in approved residency training programs are foreign medical graduates.(26/) It is also interesting to note that there are no foreign trained D.O.s in the United States because comparable osteopathic training does not exist in other countries.

In 1973, the latest year for which individual specialty data are available, there were 62,509 active foreign medical graduates in the United States, of whom 34.2 percent were in primary care specialties (excluding obstetrics and gynecology), 7.0 percent in obstetrics and gynecology, 17.7 percent in the surgical specialties, and 42 percent in the other specialties. These distributions are remarkably similar to those that prevailed for foreign medical graduates in 1970, with the exception of about a 5 percent increase

(20/) Op. cit., Altenderfer, M.E.
(21/) Supply of Health Manpower 1970, Profiles and Projections to 1990, DHEW Publication No. (HRA)75-38.
(22/) Profile of Medical Practice, 1974, American Medical Association, Chicago, 1974.
(23/) Op. cit., Profile of Medical Practice 1975-1976.
(24/) National Medical Association, Survey of Black Physicians, 1970
(25/) Haynes, M. Alfred, Distribution of Black Physicians in the United States, 1967, JAMA, 210, October 6, 1976.
(26/) Profile of Medical Practice 1975-1976, Op. cit., also prior annual additions.

in internal medicine and a doubling of the proportion in psychiatry. Within each specialty, foreign medical graduates made up varying proportions of the total supply, from about 35 percent in anesthesiology and pathology to 13 percent in general practice. However, in comparison with U.S. graduates, proportionately more FMGs are in the other specialty groups and fewer are in the medical subspecialty groups.(27/)

In comparing the major professional activity of FMGs between 1970 and 1973, it can be seen that an important change has occurred in the foreign medical graduate practice pattern. In 1970, 38.4 percent of the FMGs were in office base practice. Three years later, 42.4 percent of active foreign medical graduates were office based, representing a 30 percent increase. In contrast there has been a significant decrease, from 50 to 42 percent, in the numbers of foreign medical graduates in research, teaching and administration and in hospital based practice. (28/)(29/)

These aggregate statistics somewhat obfuscate the role FMGs play in the provision of specific services. For example, more than one-half of the physicians employed in State mental hospitals at the beginning of 1975 were FMGs, although only 58 percent held an unlimited license to practice in the State in which they were working.(30/) Furthermore, according to a study of physicians involved in Medicaid services in Maryland, it was found that FMGs played a much larger role than did U.S. physicians.(31/)

As our health care system continues to evolve, it will become essential to evaluate continuously the role of foreign medical graduates. As demonstrated, in the last decade, there has been an unprecedented growth in their number, which has tapered off only in the last few years. This growth has resulted, in part, from the availability of graduate training positions and the rising demand for medical services, both related to the increased spending for health care. In view of the future restrictions on entry of FMGs under new legislation, shortages may occur in some specialties and specialty service areas, such as those provided in mental hospitals and in Medicaid programs.

Specialty Manpower and Its Relation to Services and Productivity

In order to relate enumerations of physicians by speciality to the real world of medical care delivery, the nature of the medical and surgical services delivered and the varying degrees of productivity must be taken into account. Published numerical distributions of physicians by specialty represent aggregate numbers encompassing diverse professional groups. These groups include physicians rendering varying amounts of care in

(27/) Martin, B.C., Medical School Alumni, American Medical Association, Chicago, 1975.
(28/) Haug, J.N., and Martin, B.C., Foreign Medical Graduates in the U.S., 1970, American Medical Association, 1971.
(29/) Op. cit., Martin, B.C.
(30/) U.S. Medicine, September 15, 1976, p. 3.
(31/) Studnicki, J., et. al., Foreign Medical Graduates and Maryland Medicaid, New England Journal of Medicine, 294, May 1976, p. 1153.

specialty areas other than the one in which they are enumerated; physicians who may be semi-retired; physicians with varying amounts of training in their specialty area ranging from those still in training to those who have board certification status; and, physicians who are licensed as well as those who are unlicensed.

Disaggregated data by training status are also misleading because interns and residents do play a significant role in health care delivery despite the fact they are "in training." Their role in the provision of patient services has created concern by the Congress and by third party payers. According to an activity analysis conducted for the Social Security Administration by the Institute of Medicine involving over 5,000 House Officers (interns and residents) about 61.0 percent of their time is spent in delivering patient care; 14.9 percent in the combined activities of patient care with teaching; 15.7 percent in learning; and the remaining 8.3 percent in teaching, research and other activities. Among the ten individual specialties included in this study, the amount of time devoted to patient care alone varied from 47.5 percent for pathologists to 70.7 percent for anesthesiologists and 73.8 percent for family practitioners.(32/)

Productivity is another important parameter that affects the delivery of services by specialists. Productivity as measured by the number of patient visits is dependent upon specialization, type of practice, employment setting, geographic location, sex, age, and numbers of hours worked, as demonstrated in the following statistics: In 1974, the average number of total patient visits per week for specialists in the major specialty categories was 125.8, however, it varied among specialties from 32.0 for anesthesiologists to 174.4 for general practitioners. Similarly, the number varied by type of practice and specialty, with physicians in group practice generally having higher numbers of patient visits per week than physicians in solo practice (120.6-152.1 compared to 119.7). Locational variations were also significant, with non-metropolitan specialists averaging 166.2 patient visits per week, compared to metropolitan physician specialists having 104.8-128.4 patient visits per week.(33/) High degrees of correlation were also found between numbers of visits and total hours worked in a study of physician capacity utilization. This same study also addressed organizational barriers to access and found that highly productive physicians could compensate substantially for the differences in actual physician to population ratios between rural and urban areas. These compensations appear to have made access to physician services fairly even across broad geographic regions, including both large and small SMSAs and non-metropolitan areas.(34/) However, it should be noted that numerous other factors besides productivity affect access, including geographic, educational, financial and organizational considerations. Furthermore, the use of geographic regions as a unit for analysis masks significant local variations in availability of physicians and populations served by them.

(32/) Institute of Medicine, Medicare-Medicaid Reimbursement Policies, National Academy of Sciences, Washington, D.C., July 1976.
(33/) Op. cit., Profile of Medical Practice 1975-1976, p. 135-137.
(34/) Held, P.J., A Comparison of Primary Care Physicians in Large Metropolitan Areas and in Non-Metropolitan (Rural) Areas of the U.S., 1973-1974, Mathematic, Inc., 1976.

The productivity differences in male and female physicians are evidenced by their differences in actual working hours. Female M.D.s work 37.5 hours per week in direct patient care compared to male M.D.s who work 46.5 hours.(35/) Despite the lower number of hours worked by women, an increasingly higher percentage of them are working full-time, with shorter interruptions for family formation. This upward trend in hours of practice, in addition to the extended life span of women physicians and their propensity to remain active beyond retirement age, should amplify their productivity over time.(36/)(37/)

The inverse relationship between productivity and age is shown by a study of surgeons in which it was found that over half of the surgeons with low operative workloads were over 55, compared to only 14 percent of the surgeons with high operative workloads.(38/)

In an effort to relate actual head counts to full-time equivalent (FTE) physicians the AMA conducted a study on a sample of 4,400 physicians for whom they had data on actual hours worked in individual specialty areas. The work-week standard used for full-time equivalence in their calculations was 60 hours for primary, secondary and tertiary specialists. However, recent data from the AMA indicate that the standard should be reduced to at most, 50 hours.(39/) The preliminary results from this study on the distribution by head count and full-time equivalents are displayed in Table 5. Here it can be seen that when full-time equivalents are used instead of head counts, distributional shifts occur in all dimensions. For example, it can be seen that younger physicians and male physicians spend more hours in practice than do older physicians and female physicians. Also of note is the increase in numbers of surgeons largely at the expense of the "other" physicians category, but also at the expense of the primary care category. If a standard of 50 hours had been used, these shifts would have been even greater.(40/)

It is not certain how present trends in U.S. medicine will affect future physician specialist supply. These trends include increased consumer expectations, the movement toward group practice, the use of new health practitioners, and technological advances, e.g., early detection and treatment of disease will bring about a healthier population and a diminishing need for health services. However, it should be noted that all these trends are not as clear cut as they may appear on the surface.

(35/) Op. cit., Profile of Medical Practice, 1974.
(36/) Heins, Marilyn, et. al., Productivity of Women Physicians, Special Communication, JAMA, Volume 236, No. 17, October 26, 1976, pp. 1961-1964.
(37/) Jassim, Judith and Muller, Charlotte, Education for Women: How good an Investment? JAMA, Volume 236, No. 17, October 25, 1976, pp. 571-580.
(38/) Nickerson, R.J., et. al., Doctors Who Perform Operations, New England Journal of Medicine, 295, October 1967, p. 92.
(39/) Profile of Medical Practice 1975-1976, p. 135.
(40/) American Medical Association, Socioeconomic Issues of Health, 1975-1976, p. 34.

TABLE 5

Comparison of Headcount and Full-Time Equivalency
Distribution of Physicians-Specialty by Age and Sex

ADJUSTED M.D. DISTRIBUTION AND PRODUCTIVITY OF SUPPLY, 1975

Headcount Distribution of Physician-Specialty by Activity, Age and Sex

Federal and Non-Federal Total	Total M.D.s 4,382	G.P. & F.P. 767	Medical Specialties 1,143	Surgical Specialties 1,356	Other 1,116
Age Range					
Under 35	681	60	203	175	158
35 through 54	2,472	346	634	796	664
55 and over	1,230	361	306	385	294
Sex					
Male	4,180	741	1,057	1,329	1,020
Female	202	26	86	27	96
Federal Total	281	18	94	67	117
Non-federal Total	4,101	749	1,049	1,289	999
Professional Activity					
Direct Patient Care	3,826	739	958	1,245	827
Office Based	3,236	700	812	1,109	611
Hospital Based	591	39	146	136	216
All other activities	275	10	91	44	172

TABLE 5 (a)

Full-time Equivalency Distribution of Physician-Specialty by
Activity, Age and Sex

Federal and Non-Federal Total	Total M.D.s 4,382	G.P. & F.P. 756	Medical Specialties 1,163	Surgical Specialties 1,441	Other 1,023
Age Range					
Under 35	681	66	233	228	154
35 through 54	2,472	360	649	848	615
55 and over	1,230	331	279	364	256
Sex					
Male	4,180	735	1,085	1,414	946
Female	202	20	77	27	77
Federal Total	281	14	93	70	103
Non-federal Total	4,101	740	1,070	1,371	920
Professional Activity					
Direct Patient Care	3,826	730	987	1,333	775
Office Based	3,235	688	823	1,148	575
Hospital Based	591	42	164	185	200
All other activities	275	10	82	38	145

TABLE 5 (b)

Shifts in Distribution of Physicians From Headcount to Full-time Equivalency Specialty by Activity, Age and Sex

Federal and Non-Federal Total	Total M.D.s	G.P. & F.P.	Medical Specialties	Surgical Specialties	Other
Federal Total	NC	-11	20	85	-93
Age Range					
Under 35	855	6	30	53	- 4
35 through 54	32	14	15	52	-49
55 and over	-116	-30	-27	-21	-38
Sex					
Male	33	- 6	28	85	-74
Female	- 33	- 6	- 9	0	-19
Federal Total	- 15	- 2	- 1	3	-14
Non-federal Total	15	- 9	21	82	-79
Professional Activity					
Direct Patient Care	57	- 9	29	88	-52
Office Based	3	-12	11	39	-46
Hospital Based	54	3	18	49	-16
All other activities	-42	0	- 9	- 6	-27

Source: Socioeconomic Issues of Health, 1975-1976, American Medical Association, Chicago, 1976.

Practitioners in groups although generally more productive than their colleagues in solo practice tend not to maximize their productivity. Furthermore, while group practice is still held up as the ideal practice by many, its growth continues to be relatively slow, at an annual rate of less than 4 percent since 1969 compared to its growth of 18.5 percent between 1959 and 1965.(41/) While the appropriate use of new health practitioners has been shown to increase productivity significantly, there are at present only about 7,900 such practitioners, not all of whom are engaged in primary care. Moreover, political pressures from the other health professions and their dependence on Federal funding make their future uncertain.(42/)(43/) Despite the fact that technological advance holds great promise for improving the efficiency and effectiveness of physician services, it would appear from past experience in the health industry to lead to greater manpower needs, rather than to reduced needs, unlike other industries.

Often overlooked, but of great importance are the several factors that may diminish the productivity of primary care physicians as measured by numbers of visits in the future. The most productive primary care physicians, namely, general practitioners, are retiring and not being replaced. Since they are generally older than their colleagues, they can be expected to leave practice by reasons of illness, retirement and death at a faster rate than the younger specialists. Furthermore, those remaining in practice will become less active as they enter their fifties and sixties, when the productivity of all physicians decreases. The high cost of liability insurance makes it unattractive for older physicians to practice part-time, and this also affects younger physicians in clinics, emergency rooms, and in some private practices. The other primary care specialists who are replacing general practitioners, namely family practitioners, internists, and pediatricians are less productive, that is, handle fewer patient visits per day as demonstrated earlier. Finally, new demands on physician time, such as quality control, continuing education, the younger physicians' apparent desire for a more leisurely life style, and the increasing proportion of women may also contribute to a reduction in the total number of hours worked per week.

Compounding the problems associated with varying productivity levels is that of the variations in types of services provided by specialists. The overlap among specialists in the rendering of primary care also applies to services which can and are being provided by physician extenders. Similar overlaps in potential and/or actual duties occur among non-primary care physicians and their mid-level health practitioner counterparts, for example, psychiatrists and psychologists, ophthalmologists and optometrists, anesthesiologists and nurse anesthetists, physiatrists and physical therapists, and orthopedists and podiatrists. At the same time, non-primary care such as surgery is currently being performed by primary care and medical specialists. For example, in a recently completed study of doctors performing operations it was found that 27 percent and 22 percent

(41/) Op. cit., Profile of Medical Practice, 1975-1976, p. 9 and 129.
(42/) Detmer, R.M., Physician Assistants, Education, Accreditation and Consumer Acceptance, American Medical Association, Chicago, 1975.
(43/) State University of New York, Buffalo, New York, Study on Nurse Practitioners, October 1976.

of operations performed were attended by general practitioners and medical specialists.(44/)

As can be seen from the above discussion, more than one enumeration method must be used in order to minimize the errors that arise from the use of the relatively soft available data on physician manpower.

INTERNS AND RESIDENTS

Introduction

In order to gain insight into future trends in specialty mix it is necessary to look at the characteristics of physicians in training, namely, interns and residents. Graduate medical education is in a state of flux, resulting in part from the abolition of the freestanding allopathic internships. Many specialties are reappraising the purpose of the first year of medical training calling it postgraduate year one (PGY-1). In some specialties, PGY-1 appears to represent an additional year of training in a primary care specialty. Thus, the content and nomenclature for PGY-1 positions are in a state of flux. In view of the fact that much remains to be resolved on this issue, our analysis will center on the system as it exists today.

Data Sources

The main sources of data on intern and resident trainees are the Liaison Committee on Graduate Medical Education's Directory of Accredited Residencies, 1975-1976, previous editions of the Directory of Approved Internships and Residencies of the AMA (45/) and the Education Annual to the Journal of the American Osteopathic Association.(46/) Other sources of information on residents, fellows and training positions offered are the special reports by the Council of Teaching Hospitals of the AAMC, the National Intern and Resident Matching Program, the Educational Council for Foreign Medical Graduates and the American Hospital Association. These data sources are described in Table 6 along with their relative assets and limitations.

There are several problems associated with these data sources not described in the table. Among them is the fact that little is known about the role of the house officer in the provision of services, although preliminary information from the Institute of Medicine and House Officer Effort Distribution studies indicate that it is significant.(47/)(48/) Also there are inadequate data on the numbers of first-year trainees in primary care residencies who subsequently become subspecialists. For example, the estimates of the numbers of general internal medicine trainees who later enter

(44/) Op. Cit., Nickerson, R.J., et. al.
(45/) Directory of Approved Internships and Residencies, American Medical Association, Annual Edition, 1961-1974.
(46/) Education Annual, Supplement to Volume 74, Journal of the American Osteopathic Association, 1975.
(47/) Op. cit., Institute of Medicine
(48/) Technomics/BHM NTIS #PB 258463/AS

TABLE 6
Intern and Resident Data Sources

Data Sources	Assets	Limitations
1. Directory of Approved Internships and Residencies. Contains data on distributions of first year and total residents by specialty (30 listed) country of education and affiliation status of hospital. Also lists numbers of positions offered and filled by specialty and affiliation and numbers of positions offered for the forthcoming year.1/	Most complete source of data available on M.D.s in training. Published and updated annually.	Usually it is two years out of date. Does not provide distributions of residents by institutions. Physicians listed as first year residents in some specialties may in fact be in their second or third year of training.
2. American Osteopathic Association Educational Annual. Contains data on residents in osteopathic hospitals by specialty and institution.2/	Most complete source of data on D.O.s in training. Published and updated annually. Provides distributions of residents by institution.	Does not provide disaggregated data on residents by years in training. No information provided on D.O.s training in non-AOA approved programs such as AMA approved hospitals.

TABLE 6 (con't)

Intern and Resident Data Sources

Data Sources	Assets	Limitations
3. Council of Teaching Hospitals. Provides data on interns and residents by institution. 3/	Provides distributions of interns and residents by institution. Published and updated annually. Timely, 1976 data available in 1976.	Does not provide distributions of residents by specialty or years in training.
4. Medical Intern and Resident Matching Program. Provides information on specialty distributions of first year and total residents in AMA approved hospitals who participate in the program. 4/	Provides indications of student specialty and institutional preferences. Timely, 1976 data available in 1976.	Does not provide information on unmatched graduates and foreign medical graduates variously estimated at 10-30 percent of the total first year resident supply. 5/ 6/

1/ Directory of Approved Internships and Residencies 1975-1976, American Medical Association, Chicago, 1976.
2/ Educational Annual 1974 Journal of the American Osteopathic Association, 1975.
3/ Council of Teaching Hospitals, Directory, 1976, Association of American Medical Colleges, January, 1976.
4/ Op. cit., Directory of Approved Internships and Residencies.
5/ Graettinger, J.S., Graduate Medical Education Viewed from the National Intern and Resident Matching Program. J. Med. Educ., 51, Sept. 1976.
6/ Biles, B., Communication to Staff of the Senate Committee on Labor and Public Welfare, June 6, 1976.

internal medicine subspecialty training vary from 25-42 percent.(49/)(50/) Finally, it should be noted that many first-year residents are not in fact enrolled in their first year of residency but may be in their second, third or fourth year of training, and are listed as first-year residents in one specialty which requires some training in another specialty. Thus, this analysis will be based upon the present data fully recognizing its inherent inaccuracies and limitations.

In order to better understand future trends in the physician specialty distribution, it is important to review trends in the educational pipeline. Virtually all U.S. M.D. graduates will continue to enter residency training programs as will increasing proportions of D.O.s. However, it is not certain how many D.O.s designate themselves as specialists without residency training. In 1975, about one-fourth of all osteopathic graduates continued postdoctoral training immediately following their internship. Due to the lack of trend data on residency distributions of D.O.s and assuming that future significant shifts in patterns of career choice do not occur, the distribution of filled first-year residencies may be used to project specialty training in the foreseeable future.(51/)

The number of first-year residency positions offered by specialty is, among other factors, a function of departmental prestige, institutional service requirements, and the adequacy of resources to sustain the program, rather than quantitative perceptions on the local or national need for the type of physicians being trained. A recent survey by the Institute of Medicine of 414 training program directors in teaching hospitals of all types found that the "education environment" was a more important consideration in determining the numbers of positions than "community need." In the future, funding constraints may have greater impact on program size. For example, in New York State, Blue Cross has set limits for residency slots among specialties.(52/) In addition, the residency accreditation process, for the most part, relies on program characteristics and resource availability, (e.g., faculty, beds). Questions of regional or national manpower need are left unaddressed.(53/)

There are wide variations among specialties in the numbers of allopathic residency positions offered and the numbers of positions filled. In the aggregate, residents have only limited freedom in making their specialty choices. This is exemplified by the residency fill rate of 91.3 percent of positions offered in the 1974-1975 year (52,685 filled, 57,681 offered). Among the specialties, fill rates ranged from 83 percent in pathology to 99 percent in ophthalmology.(54/) The specialty choice options, in the aggregate, were broader for osteopathic residencies, with 923 positions offered and only 484 filled, for a fill rate of 52 percent.(55/) If the present trends continue, the disparity between the numbers offered and filled will narrow further due to the increasing size of graduating classes of M.D.s and D.O.s.

(49/) Op. cit., Biles, B.
(50/) Webster, G.C., Personal communication to Dr. R. Graham, March 9, 1976.
(51/) Osteopathic Manpower Information Project, HRA Contract No. 231-75-0615.
(52/) Weston, J., National Center for Health Services Research, HRA/DHEW, Personal communication, December 30, 1976.
(53/) Op. cit., Institute of Medicine.
(54/) Directory of Accredited Residencies, Liaison Committee on Graduate Medical Education, 1975-1976, AMA, Chicago, 1977.
(55/) Osteopathic Manpower Information Project, op. cit.

Trends in First-Year Residency Distribution by Specialty in Allopathic and Osteopathic Hospitals

In the academic year of 1974, there were a total of 18,834 M.D.s in the first postgraduate year of training, compared to 11,080 in 1960. This represents a 70 percent increase.(56/)(57/) Similarly, there were 195 D.O.s in the first year of graduate training in AOA approved hospitals in 1974, compared to 102 in 1970, a 91 percent increase.(58/)(59/)

Residents in Primary Care

Table 7 shows the distribution of first-year residents in AMA approved training programs. It is apparent that the aggregate increases in primary care trainees between 1960 and 1974 are greater than the overall increases for the total numbers for the same period. It should be noted, however, that the actual counts and percent increases overstate the ultimate number of primary care specialists because increasing numbers of first-year internists and pediatricians later enter subspecialities. For example, based upon recent trends, about 9 percent of those who entered first-year residency training in internal medicine programs in 1973 were not in second year programs in 1974. It is assumed that this 9 percent is made up of physicians who elect one year of training in primary care prior to beginning training in the surgical or other non-primary care specialties--probably due to the abolition of the free-standing internship in 1975. Similarly, it is conservatively estimated by the AMA that another 25 percent of those completing at least one year of general internal medicine training will later enter the internal medicine subspecialties. The same phenomenon has occurred in pediatrics with about 8 percent of all the first-year residents in general pediatrics entering the pediatric subspecialties. Thus, the number who remain in primary care in internal medicine could be reduced to 3,107, and the number remaining in pediatrics to 1,655. Applying similar corrections to 1974 figures, the percent in primary care would be 32.5 percent as opposed to 41.0 percent as previously stated.(60/)

Unfortunately, little is really known about the magnitude of these trends and the resultant losses from the primary care physician supply. A recent study of physicians in the specialty of cardiology showed that about half of the cardiologist's time was devoted to care in the specialty of cardiology, with the remaining half devoted to primary care.(61/) If such findings apply to other subspecialties of primary care, questions might be raised about the relationship among training program objectives, the purpose of the certification process and the provision of high quality, cost effective primary care services. Obviously, these trends and their implications for the future supply and distribution of specialty manpower need further investigation before definitive conclusions can be reached.

(56/) Directory of Approved Internships and Residencies, 1961, AMA, Chicago, 1961.
(57/) Tracey, R., Personal communication, AMA, November 1976.
(58/) Medical Education in the U.S., 1975-1976, JAMA, December 27, 1976.
(59/) Directory of Approved Internships and Residencies, 1971-1972, AMA Chicago, 1971.
(60/) Op. cit., Biles, B.
(61/) Op. cit., Peterson, O.L., et. al., American Journal of Cardiology.

TABLE 7

Trend data on number and percent distribution by specialty of first-year residents, and comparisons between first-year positions offered and filled, 1960, 1968 and 1974

Specialty	Total Number and Percent Distribution of First-Year Residents, 1960, 1968, and 1974						Percent Growth Between 1960 and 1974 and Between 1968 and 1974	
	1960		1968		1974		% Growth	% Growth
	#	Percent	#	Percent	#	Percent	1960-1974	1968-1974
TOTAL	11,080	100.0	12,864	97.8	18,834	100.0	+ 70.0	+ 46.4
PRIMARY CARE	3,443	31.1	3,796	29.5	7,724	41.0	+124.3	+103.5
General Practice	364	3.3	258	2.0	162	.9	-124	- 37
Family Practice	-	-	-	-	1,199	6.3	-	-
Internal Medicine	2,193	19.8	2,589	20.1	4,553	24.2	+153	+114
Pediatrics	886	7.9	949	7.3	1,810	9.6	+104	+ 91
SURGICAL SPECIALTIES	4,274	38.6	4,475	34.8	5,852	31.1	+ 47.3	+ 23.1
General	2,122	19.1	2,394	86.1	2,639	14.0	+ 24	+ 10
Neurological	101	.9	119	.9	129	.7	+ 27	+ 8
Ophthalmology	288	2.6	418	3.2	504	2.7	+ 75	+ 21
Orthopedic	353	3.3	403	3.1	609	3.2	+ 72	+ 51
Otolaryngology	153	14.2	206	1.6	270	1.4	+ 76	+ 31
Plastic	47	.4	90	.7	184	.9	+298	+104
Thoracic	89	.8	137	1.1	147	.8	+ 65	+ 7
Colon & Rectal	-	-	6	.05	30	4.8	-	+500
Urology	204	1.8	222	1.7	310	1.6	+ 52	+ 40
Ob/Gyn	917	8.3	759	5.9	1,030	5.5	+ 12	+ 35
OTHER MEDICAL	102	.9	259	2.0	381	2.0	-	+ 4.7
Pediatric Allergy	-	-	39	.3	59	.3	-	+ 44
Pediatric Cardiology	-	-	54	.4	58	.3	-	+ 7
Dermatology	102	.9	166	1.3	264	1.4	+102	+ 63

TABLE 7 (con't)

Specialty	Total Number and Percent Distribution of First-Year Residents, 1960, 1968, and 1974						Percent Growth Between 1960 and 1974 and Between 1968 and 1974	
	1960		1968		1974		% Growth	% Growth
	#	Percent	#	Percent	#	Percent	1960-1974	1968-1974
OTHER SPECIALTIES	3,261	29.4	4,055	31.5	4,877	25.9	+ 50.0	+ 20.0
Anesthesiology	550	.6	677	5.3	715	3.8	+ 30	+ 6
Child Psychiatry	-	-	99	.8	287	1.5	-	+298
Neurology	149	1.3	249	1.9	381	2.0	+148	+ 49
Pathology	757	6.8	661	5.1	807	4.3	+ 7	+ 22
P.M. & R	55	.5	95	.7	122	.6	+121	+ 28
Psychiatry	1,090	9.8	1,209	9.4	1,564	8.3	+ 30	+ 23
Nuclear Medicine	-	-	-	-	53	.3	-	-
Forensic Path.	-	-	-	-	24	.1	-	-
Neuropathology	-	-	-	-	26	.1	-	-
Radiology	554	5.0	849	6.6	225	1.2	-146	-277
- Therapeutic	-120	-	-	-	120	.6	-	-
- Diagnostic	-553	-	-	-	553	2.9	-	-
Miscellaneous	106	.9	216	1.7	-	-	-	-

Source: Directory of Approved Internships and Residencies in the United States. 1961, 1969-1970, and 1975-76 editions, Chicago. American Medical Association, 1961, 1970, and 1976.

TABLE 7 (a)

Total Number of First-Year Positions Offered and Percent Filled, 1960, 1968, 1974

Specialty	1960 # Offered	1960 % Filled	1968 # Offered	1968 % Filled	1974 # Offered	1974 % Filled
TOTAL	12,622	84	15,365	83	20,405	92
PRIMARY CARE	3,974	77	4,523	85	8,016	96
General Practice	498	73	477	54	181	90
Family Practice	-	-	-	-	1,317	91
Internal Medicine	2,492	88	2,885	90	4,643	98
Pediatrics	984	90	1,161	86	1,875	97
SURGICAL SPECIALTIES	4,361	97	5,347	89	6,210	94
General	2,331	91	2,718	88	2,828	93
Neurological	110	91	129	92	141	91
Ophthalmology	303	95	431	97	509	99
Orthopedic	383	92	443	91	635	96
Otolaryngology	173	88	226	91	285	95
Plastic	52	90	98	92	194	95
Thoracic	100	89	155	88	158	93
Colon & Rectal	15	69	14	43	32	94
Urology	48	80	254	87	327	95
Ob/Gyn	946	93	879	86	1,101	94
OTHER MEDICAL	121	90	297	88	407	94
Pediatric Allergy	8	78	49	84	70	84
Pediatric Cardiology	-	-	69	80	70	83
Dermatology	113	90	179	93	267	99
OTHER SPECIALTIES	4,166	76	5,198	74	5,772	84
Anesthesiology	696	79	846	80	787	90
Child Psychiatry	40	70	191	62	376	76
Neurology	196	76	293	85	387	93
Pathology	1,081	70	1,109	60	1,004	80
P.M. & R	103	53	161	60	166	73
Psychiatry	1,379	79	1,657	73	1,773	88
Nuclear Medicine	-	-	-	-	72	73
Forensic Path.	-	-	-	-	48	50
Neuropathology	-	-	-	-	40	-
Radiology	671	81	941	90	294	76
- Therapeutic	-	-	-	-	165	73
- Diagnostic	-	-	-	-	660	84
Miscellaneous	-	-	-	-	-	-

Residents in Surgery and Other Specialties

As can be seen in Table 7, when compared to the primary care specialties, the surgical specialties have exhibited the opposite trend in growth, with the aggregate proportion (excluding obstetrics and gynecology) actually declining. Here again, the numbers of first-year residents in the individual specialties are misleading and tend to overestimate the numbers in general surgery as opposed to other surgical specialties. The only surgical specialties that neither require nor have an option for a year of general surgery for certification are obstetrics and gynecology and ophthalmology. If these first-year residents are subtracted from the total number of first-year residents in the surgical specialties, then the proportion of general surgery to the other surgical subspecialty residents has declined from about 55 percent in 1960 to 38 percent in 1974. Using these proportions, it can be estimated that 62 percent of the current first-year residents in general surgery will actually enter surgical subspecialty training. Unfortunately, the numbers of first-year residents in the medical subspecialties since 1960 are not available.

Relationships Between Residency Positions Offered and Filled

It is interesting to look at the relationship between first-year residency positions offered and filled, shown in Tables 7 and 8. One of the keys to adequate physician manpower is having a sufficient number of appropriate graduate medical education (GME) positions. It is crucial to try to assure that there will be enough GME positions to accomodate graduates of U.S. medical schools, and that the specialty mix of these positions will contribute to a desirable mix of specialists. There has been recent speculation about possible future shortages of first-year residency positions.(62/) Trend data support this contention.

A simple regression analysis indicates that all residency programs except general surgery have increasing proportions of their offered positions filled. If increasing rates of fill of positions continue, a 100 percent occupancy rate could be reached as early as 1977 in obstetrics, internal medicine, and dermatology residency programs. Psychiatry, anesthesiology, and pediatric residency programs could be expected to reach 100 percent occupancy within the next few years. This rise in percent of offered residency positions being filled is probably due both to a larger portion of U.S. medical school graduating class seeking such advanced training and to a rising number of foreign medical graduates fulfilling their residency plans in the U.S. Only the general surgery residency programs seem relatively unaffected by these rising demands.

On the other hand, the availability of first-year GME positions in each of the specialties as shown in Table 8, has remained remarkably constant over more than a decade, even with a concurrent 37 percent rise in the number of U.S. medical school graduates. Table 8 also shows the percent of each graduating class that could be accommodated in the seven residency programs

(62/) Cooper, J.A.D., Graduate Medical Education, The Changing Scene, Journal of Medical Education, September 1976, p. 775.

TABLE 8

PERCENT OF U.S. GRADUATES
WHICH COULD BE ACCOMMODATED BY
OFFERED RESIDENCY POSITIONS BY SPECIALTY

	1960	1962	1963	1969	1970	1972	1973	1974
ANES	10	11	11	10	11	10	10	9
DERM	2	2	2	2	2	2	3	2
INT	36	39	38	36	36	36	38	39
PED	14	15	15	16	15	15	15	16
PSYCH	20	21	21	21	21	21	19	18
SURG	34	35	35	36	34	34	32	31
OB/GYN	14	13	13	12	11	12	11	12
Percent of Total Graduates	130	136	136	133	129	130	128	127
Total U.S. Graduates	8,943	8,388	9,485	10,304	10,325	10,921	11,561	12,225

studied in each of the seven years between 1960 and 1974 for which data are available. Not only do the ratios between GME positions offered and U.S. medical school graduates show almost no variation, but in each residency program, the ratios of available positions to size of class in the seven sample years also remained nearly the same. For example, over the 14-year period the ratio of total positions offered to size of graduating class varied only between 127 and 136 percent. The number of psychiatry residency positions available could accommodate between 18 and 21 percent of each class sampled.

These two sample analyses give an indication of the complexity of the issues associated with graduate medical education and the need for further study of these issues and their interrelationships.

Doctors of Osteopathy in Residencies

Similar trends in the choice of first-year residency positions have been occurring among the doctors of osteopathy in both AOA and AMA approved residency training programs with increasing proportions choosing primary care.

The overall fill rate for all approved osteopathic residencies has been relatively stable at about 50 percent indicating that the overall capacity of residency programs in accredited osteopathic hospitals has not yet been stressed. Furthermore, on the basis of trend data since 1972, it appears that past average yearly increases of about 8 percent for numbers of osteopaths in AOA approved programs should continue into the future.(63/)(64/)

Women and Minority Representation

Women and minorities are increasingly represented in the training pipeline. The first-year enrollment for females in schools of osteopathy increased from 2 percent of the total in 1965 to 10.5 percent of the total in 1975-76. The numbers of females in medical schools at the same time increased from about 9 percent in 1965 to 23.8 percent in 1975.

The first-year enrollment of blacks has increased numerically, but has declined proportionally between 1971 and 1975 (from 882 or 7.1 percent to 1,036 or 6.8 percent). Enrollment for other minorities has increased both numerically and proportionately, from 181 or 1.5 percent to 355 or 2.3 percent for American Indians, Mexican Americans, and Mainland Puerto Ricans. The numbers for Asian Americans, Cuban Americans and other minorities have increased from 217 or 1.8 percent in 1971 to 396 or 2.6 percent in 1975. Similar but smaller increases in minority enrollment have occurred in osteopathic schools.(65/)(66/)

(63/) Education Annual, Supplement to Volume 74, Journal of the American Osteopathic Association, 1975.
(64/) Op. cit., Osteopathic Manpower Information Project
(65/) Op. cit., Education Annual, Supplement to Volume 74, Journal of the American Osteopathic Association.
(66/) Op. cit., Medical Education in the U.S., JAMA, December 1976.

Female M.D.s in residencies rose from 4,382 in the Fall in 1971 to 5,834 in the Fall of 1974. Among individual specialties, pediatrics accounted for the largest share of female residents in 1974, at 20 percent of the total compared to 8 percent of the total male residents. Internal medicine and psychiatry each accounted for 15 percent of the total female residents compared to 29 percent of the total male residents, and pathology accounted for 11 percent, compared to 5 percent of the total male residents. These represent basically the same distributions that have occurred in previous years.(67/)(68/)

In 1974, a total of 1,113 black U.S. citizens were serving in residencies which represented 2.3 percent of the total numbers of residents in allopathic programs. This is an increase over the 1.7 percent figure in 1968. Of this total, 255 were in internal medicine, 147 in general surgery, 154 in obstetrics and gynecology, and 50 in family practice.(69/)

In summary, the primary care specialties of family practice, pediatrics, and internal medicine residencies plus general practice attracted 36 percent of black residents, 39 percent of women residents and 36 percent of all residents in 1974. The percentages become 49 percent of blacks, 45 percent of women and 42 percent of all residents in the primary care specialties plus obstetrics and gynecology. Future trends for women and minorities are difficult to predict apart from the total resident pool due to limited data.

Foreign Medical Graduate Representation

Because many foreign medical graduates enter the United States at least initially for graduate training, they have had an especially significant impact on residency training programs. Between 1965, the first year for which FMG residency training data are available and 1974, the numbers of FMGs in residency training grew from 9,121 to 15,234 or from 28 percent to 30 percent of the total. This actually represents a decline since they reached their high of 33 percent during the academic years of 1969-1970 and 1970-1971. Comparisons among individual specialties also revealed interesting changes. In 1973, for example, 35 percent of all FMG residents were in general surgery and 30 percent were in internal medicine in contrast to 1965 when the proportions were 22 and 17 percent, respectively.(70/)(71/)

Foreign trained physicians have played a relatively large role in the training and service delivery programs of non-affiliated hospitals in comparison with hospitals affiliated with medical schools. In non-affiliated hospitals, 59 percent of the positions filled have been filled by FMGs in 1970, 1973 and 1974. In affiliated hospitals, FMGs have represented only 29 percent, 28 percent and 27 percent of the residents, in the respective years. In at least half of the specialty programs in non-affiliated hospitals, the

(67/) Op. cit., Medical Education in the United States.
(68/) Coordinating Council of Medical Education, Physician Manpower and Distribution, October 25, 1976.
(69/) Ibid., Medical Education in the U.S.
(70/) Directory of Approved Internships and Residencies, 1966-67 and subsequent editions, AMA, Chicago, 1966.
(71/) Tracey, R., Personal communication.

majority of residents are foreign trained, compared to affiliated hospitals in which only three specialties (anesthesiology, general practice and psychiatry) have a majority of foreign trained residents.(72/)(73/)

In 1974, there were 6,246 first-year FMG residents, excluding Canadians, in AMA approved hospital training programs. They represented 28 percent of all first-year residents. Thirty-three percent of these FMGs were in primary care, excluding obstetrics and gynecology; 5.5 percent were in obstetrics and gynecology; 22.2 percent were in the surgical specialties; and 41 percent were in the medical or other specialties. Thus, FMGs are distributed in primary care in lesser proportion (33 percent) than U.S. graduates (40 percent). The same is true in the surgical specialties where FMGs comprise 22.2 percent of the total compared to 25.2 percent for U.S. graduates. In the medical and other specialties, FMGs make up proportionately more of the total (41 percent) than U.S. graduates (28.9 percent). The largest proportion are in institutionally based specialties, such as anesthesiology, pathology, psychiatry, and radiology where they represent half or more of all first-year residency positions.(74/) Not surprisingly, these specialties have relatively higher proportions of unfilled residency positions (excluding FMGs from such proportions) than specialties like dermatology and ophthalmology which have smaller numbers of FMG residents.

These characteristics of FMGs have significant implications for physician specialty and manpower and any changes in their numbers or distribution will alter physician distribution in the next three or four decades. The implications of P.L. 94-484 on the influx of FMGs have yet to be assessed.

CHARACTERISTICS OF PHYSICIAN EXTENDERS (PHYSICIAN ASSISTANTS AND NURSE PRACTITIONERS)

The uneven availability of medical services in parts of the country as well as the general concern over increasing escalation of medical care costs have contributed to developing the supply and utilization of nurse practitioners (NPs) and physician assistants (PAs) during the past decade. There are about 5,100 formally trained active nurse practitioners and about 2,500 formally trained, active physician assistants. Numerous surveys have revealed that these mid-level health personnel, collectively referred to as physician extenders (PEs) are increasingly being accepted by both patients and physicians. However, their continued growth and utilization is still not certain, for many reasons, including: legal constraints; the reimbursement issue; diverse definitions of functions; diverse educational experiences of physician extenders; and to a lesser degree, the uncertain status of their training programs and the uncertainty of their relationship to one another.

In order to develop credentialing mechanisms for these professions, it is first necessary to establish the specific roles of its members. A physician assistant is defined as a person who renders services under the supervision

(72/) Op. cit., Directory of Approved Internships and Residencies, 1970-73.
(73/) Op. cit., Directory of Approved Internships and Residencies, 1974-75, and Directory of Accredited Residencies, 1975-76.
(74/) Op. cit., Tracey, R.

and responsibility of a physician.(75/) A nurse practitioner must "have advanced skills for assessing the health illness status of individuals and be able to articulate nursing therapies along side other planned therapies."(76/)

Programs preparing physician assistants are accredited through the American Medical Association Council on Medical Education in collaboration with the American Academy of Family Practice, the American Academy of Pediatrics, the American College of Physicians, the American Academy of Physician Assistants, and the American Society of Internal Medicine. The expanded role nursing programs are accredited by the American Medical Association and the National League of Nursing.

Just as economic factors and the relative scarcity of primary care services caused a rapid expansion in the supply of physician extenders in the past, these factors will determine the rate and extent of their growth in the future. Laws, customs, and a delineation of professional territory by groups and individual practitioners will also serve to facilitate or constrain their growth. These determinants generally operate in the division of labor, and in clinical medicine they may determine the actual magnitude of task delegation.

Physician Assistants

Physician assistants and Medex are defined as those professionals who are educated and trained to perform functions and tasks that have been traditionally performed only by physicians. More specifically, physician assistant and Medex roles encompass the ability: (1) to elicit a comprehensive health history; (2) to perform a comprehensive physical examination; (3) to perform simple diagnostic laboratory determinations and to understand and use their values; (4) to perform basic treatment procedures; and (5) to give appropriate clinical responses to commonly encountered emergency care situations.(77/) Although effective supervision is required, it may not be face-to-face in all cases.

There is great diversity among training programs with respect to entrance requirements, curriculum content, institutional setting and program title or name. The more common titles are physician assistant, Medex, physician associate and clinical associate. Most training programs are of two years' duration.

Currently, there are about 50 programs which have as their objective the training of assistants to the primary care physician. Another seven training programs exist which train physician assistants for other specialties such as the surgical assistant, the urological assistant and the orthopedic assistant.(78/) The majority of these programs receive support from the

(75/) American Medical Association Council on Medical Education. Essentials of an approved educational program for the assistant to the primary care physician. Adopted by the AMA, House of Delegates, December 1971.

(76/) American Nurses' Association, Inc., Definition: Nurse practitioner, nurse clinician, and clinical nurse specialist. Congress for Nursing Practice, May 1974.

(77/) Detmer, L.M., Physician Assistants, Education, Accreditation, and Consumer Acceptance, AMA, Chicago, 1975.

(78/) Op. cit., Detmer, L.M.

Federal Government and some programs receive substantial State and/or private foundation assistance.

Little has been documented about the geographical and specialty distribution and demographic characteristics of the presently active physician assistants. Therefore, DHEW supported a survey on a sample of them. Preliminary results showed that the respondents were predominately male, with an average age of 30. About half possessed undergraduate degrees, a third high-school diplomas only, and very few possessed graduate degrees. Although PAs are generally envisioned as aids to the primary care physician, one-fourth of the PAs and one-tenth of the Medex are employed in non-primary care settings.(79/)

In order to determine whether or not PAs would be used in replacement of interns due to the phasing out of the internship, the Catholic Hospital Association performed a survey on the utilization of PAs in its 672 member hospitals. The results of this survey indicated that PAs were indeed being used in hospitals of all sizes and in all locations. However, the great majority of PAs in these settings were employed by private physicians and were located primarily in the operating room.(80/) This may be the result of the AMA restriction on the direct hospital employment of these physician assistants.

Nurse Practitioners

All formally trained nurse practitioners must have a RN degree. There are a variety of programs available for training different types of nurse practitioners, namely, pediatrics, nurse midwives, maternity nurses, family, adult and psychiatric nurse practitioners. As of January 1975, there were 131 programs of which 86 were certificate programs and 45 were masters programs. The length of training required in certificate programs ranges from 3 to 15 months, with the majority lasting about a year. The length of training required for a masters degree ranges from 9 to 26 months, with the majority of the programs lasting about two years. Between 1970 and 1975, these programs graduated about 3,800 certified nurse practitioners and about 1,300 master's degree nurse practitioners.

Survey data on graduates from these programs reveal that over three-fifths of them are providing primary care (75 percent of certificate practitioners and 46 percent of master's nurse practitioners). Thirty-five percent of the survey respondents are pediatric nurse practitioners, 26 percent are family nurse practitioners, 22 percent are adult nurse practitioners, with the remaining group being nurse midwives, maternity nurses and psychiatric nurses. Most of the nurse practitioners providing primary care (63 percent) are in ambulatory practice settings. Other large groups are employed in non-hospital institutional and community settings (16 and 10 percent respectively). The same survey data show that nearly all students are female (98 percent), 90 percent are white, and about half are between the ages of 25 and 34.(81/)

(79/) Scheffler, R.M., Factors Affecting the Employment of Physicians Assistants and Medex. Preliminary Report I, January 1977.
(80/) Farrier, R.M. "Status of Physician Assistants in Catholic Hospitals, Hospital Progress, 1976, p.66.
(81/) State University of New York at Buffalo, Study on Nurses in Extended Roles, 1976.

Numerous studies have focused on the actual and potential role of the physician extender vis-a-vis physician. These studies have looked at various types of extenders in diversified types of practice settings demonstrating a variety of results with regard to ideal and actual levels of productivity. The results of these studies are displayed in Table 9. It should be noted that these studies vary in their quality, and therefore, the results displayed are not equally valid.

GEOGRAPHIC DISTRIBUTION OF PHYSICIANS AND PHYSICIAN EXTENDERS

There is significant overlap in the issues which relate to manpower supply and distribution by geographic areas. Increasing the supply of manpower will not guarantee the amelioration of the geographic distribution problems present in the system, assuming that the present factors underlying geographic distribution remain the same. The degree of unequal geographic distribution varies among specialties and reflects a variety of causes. Two interacting factors which account in part for geographic distribution are population density and community wealth. Not surprisingly, physician distribution also parallels the distribution of hospital beds.

Among the factors which relate to physician distribution are the requirements by many specialists for expensive and sophisticated equipment, institutional support services and dependance upon referrals for many of his/her patients. The specialist also requires a large population base containing a sufficient number of persons with categorical diseases who seek such specialty services. The existence of a large population base provides for cost effectiveness while maintaining proficiency of the specialist. In general, the largest specialties, with the exception of psychiatry, are better distributed than the smaller secondary and tertiary level specialties which are concentrated in the more urban referral centers. However, there are some urban areas in which shortages of these latter specialists do exist.

Geographic area analyses of physician distribution by specialty are usually performed at one of three levels: the State, Health Service Area (HSA) or county level. The needs, expectations and utilization patterns of particular populations vary demographically. People often cross State and county lines to obtain medical services. As a result, the quantitative evenness of physician to population ratios is somewhat misleading since the numerator (physicians) and denominators (people) are not always related. One method of correcting for these problems is to use market areas as proposed by Leyes who demonstrated that health service areas closely approximate economic trade areas.(82/) Unfortunately, data at this level are not always available and/or accessible. A further problem with the use of the physician to population ratio is the vast differences and variations in the types of services provided by physicians as has been described.

In the absence of a better analytical method and market area specific data, the following discussion focuses on State, county and HSA physician to population ratios notwithstanding their inherent limitations. Distribution of

(82/) Leyes, J.W., The Delineation of Economic and Health Service Areas and the Location of Health Manpower Education Programs, University of Wyoming, Laramie, Wyoming, February 1974.

TABLE 9

ESTIMATES OF PRODUCTIVITY GAIN *
REALIZED BY HIRING MID-LEVEL HEALTH PRACTITIONERS

SPECIALTY	TYPE OF PRACTICE	MAIN TYPE MID-LEVEL PRACTITIONER PRESENTLY USED	PERCENT INCREASE IN PATIENT VISITS
General and Family Practice and Internal Medicine	Solo	PA or NP	1/ 37 - 90 2/
	Group	PA or NP	53 - 100 3/
	Institution	PA or NP	4/ 38 - 63 5/
	HMO	PA or NP	6/ 38 - 47 7/
Pediatrics	Solo	NP	8/ 33 - 100 9/
	Group	NP	43 - 100 10/
	Institution	NP	71 - 82 11/
	HMO	NP	47 12/
Obstetrics and Gynecology	Solo	Nurse Midwife	43 - 75 13/
	Group	Nurse Midwife	61 - 98 14/
	Institution	Nurse Midwife	15/ 23 - 44 16/
	HMO	Nurse Midwife	23 - 44 17/ 18/

* As measured by percent increase in number of patient visits per week realized after hiring one mid-level practitioner.

1/ Nelson, E.C., et al., Impact of Physician's Assistants on Patient Visits in Ambulatory Care Practices, Annals of Internal Medicine 82, 1975, p. 608.

2/ Rabin, D.L., Georgetown University, Department of Community Medicine and International Health, 1976.

TABLE 9 (con't)

3/ Reinhardt, U.E. and Yett, D.E., Physician Productive Functions Under Varying Practice Arrangements, Community Profile Survey Data, Technical Paper No. 11, January 1971.

4/ Schulman, J. and Wood C., Experience of a Nurse Practitioner in a General Medical Clinic, JAMA 219, March 1972, p. 1953.

5/ Scheffler, R.M., The Productivity of Physician Assistants: Empirical Estimates, Presented at the Western Economic Association Meeting, June 1976.

6/ Steinwachs, D.M., et al., The Role of New Health Practitioners in Prepared Group Practices, Medical Care, 14, February 1976, p. 95.

7/ Record, Jane C., Cost Effectiveness of Physician's Assistants, Kaiser Foundation Health Services Research Center, HRA NO1-MB-44173, Final Report, November 1975.

8/ Chancy, E., and Kitzman, H.K., The Child Health Nurse (Pediatric Nurse Practitioner in Private Practice) A Controlled Trial, NEJM, 285, Dec. 1971.

9/ Bergman, A.B., et al., Performance Analyses in Pediatric Practice: Preliminary Report: Journal of Medical Education, 42, March 1967.

10/ Op cit., Reinhardt and Yett

11/ Silver, H.K., and Hecker, J.A., The Pediatric Nurse Practitioners and the Child Health Associate, New Types of Health Professionals, Journal of Medical Education, 45, March 1970.

12/ Op cit., Record, J.C.

13/ Kehrer, M. and Zeretsky, H.W.; A Preliminary Analysis of the Productivity of Allied Health Personnel in Primary Medical Practice, Vol. 1, Center for Health Services Research & Development, AMA, June 1972.

14/ Op cit., Reinhardt and Yett.

TABLE 9 (con't)

15/ Helman, L.B. and O'Brien, F.B.; Nurse Midwives - An Experiment in Maternity Care, Obstetrics and Gynecology, 24, September 1964, p. 343.

16/ Op cit., Silver and Hecker.

17/ Op cit., Helman and Obrien.

18/ Op cit., Silver and Hecker.

specialists by State can be viewed from two aspects: first, by the proportion that the specialty comprises of all patient care physicians and second, by the population ratio that exists for that specialty. In densely populated States, specialists tend to be high in both counts, but the opposite holds true for general practitioners who exhibit both higher physician to population ratios and higher proportions in sparsely populated States. The situation is still different for other primary care physicians. While primary care M.D.s tend to represent a higher proportion of patient care M.D.s in the sparsely populated States, the ratio to population still tends to be low. Internists, pediatricians and obstetricians all have ratios below the national average in these areas. Thus, it is the high proportion of general practitioners that causes the aggregate proportion of primary care M.D.s to be higher in rural areas.

Geographic distribution is more even for family practitioners.(83/) Survey data on family practitioners show that about a third indicate a preference for practice in small communities and in non-SMSA counties. Therefore, if family practice continues to grow at its present rate, its distribution may become similar to that of general practice. At present, annual additions of family practitioners is less than lossess of general practitioners.

Understanding statistics on the unequal geographic distribution is compounded further by the inclusion of interns and residents in the population ratios and proportions. Although they are providers of patient care, they also function in training capacities and therefore may not be considered directly equivalent to full-time physicians. If interns and residents are subtracted from State numbers of specialists, the ranking of specialist manpower among States will not change significantly, but the degree of variation among States will be reduced somewhat. Urban States, having the larger number of training centers, interns, and residents, would have their specialist manpower reduced thereby narrowing the difference between them and the rural States.

There are several other possible explanations for the wide variations in physician population ratios among the States. First, the mortality rate may be significantly different among States, although, this explanation can be refuted by the example of Utah and Nevada. Nevada has significantly higher mortality rates than Utah despite the fact that its physician to population ratio and hospital bed to population ratio are similar to those of Utah.(84/) Second, some States may have a surplus of specialists who provide services in other specialty areas and/or are being underutilized. Historically, health manpower resources have acted as determinants of the amount of health services utilized. For example, studies in Kansas, Vermont, and across Canadian Provinces show the overall supply of surgeons and hospital beds strongly affect the incidence rates for surgery. In Vermont, it was demonstrated that areas having more surgeons showed greater rates of surgery than areas with a greater number of general practitioners. The reverse is also true for areas with a greater number of general practitioners. Within the comparative study areas of these States, the methods of payment, insurance coverage, and the basic methods of practice organization were similar, as

(83/) Graham. R., Family Practice Residents Location, Memorandum, American Academy of Family Practice, September, 1975.
(84/) Fuchs, V., Who Shall Live?: Health, Economic and Social Choice, New York, 1974.

were the sociodemographic characteristics of their populations.(85/) State distributions of specialists are displayed in Table 10.

Physician distributions are also viewed at the county level. As Table 11 indicates, the proportion of non-Federal M.D.s in 1974, in metropolitan counties was almost six times that in non-metropolitan counties, as compared with 1963, when it was almost four times as high. Similarly, while the physician per 100,000 population ratio for all counties has increased from 120.3 in 1963, to 130.9 in 1974, the ratio has decreased in non-metropolitan counties from 73.8 to 70.4. Likewise, the proportion of M.D.s in non-metropolitan counties compared to metropolitan counties declined from 20.9 to 14.5 percent over the same period of time.

The disparity of the physician supply between urban and rural counties is further illustrated by the fact that in 1975, 87.1 percent of all non-Federal physicians were located in the Nation's 300 major metropolitan counties. Within these areas there are far more doctors in the suburbs and affluent urban areas than in the inner city. On the other hand, there are 145 counties (most of them sparsely populated) which have no active M.D.s. Furthermore, non-metropolitan areas have had higher proportions of older physicians than the Nation as a whole.(86/)

In view of this unequal distribution, Congress, in the Emergency Medical Services Systems Act of 1973, P.L. 93-154, and again in the recently enacted health manpower legislation P.L. 94-484, has emphasized that federally supported health manpower programs should focus on health manpower shortage areas. For the purpose of implementing these programs, the Secretary of HEW must publish and routinely update a list of areas so designated. Critical health manpower shortage areas were designated in the past on the basis of a physician (non-Federal office based, primary care) to population ratio of 1:4,000 as a critical value below which an area is designated as a critical health manpower shortage area.(87/) Guidelines being developed now for shortage area designation will include several variables in addition to physician-population ratios.

Locational Patterns of Doctors of Osteopathy

The geographic distribution of physicians by specialty is, in part, also related to the uneven national distribution of osteopaths who, in some States, represent a sizeable component of total physician manpower. In 1974, D.O.s were distributed unevenly among the States primarily because until recently they were not allowed complete practice privileges in many States. The largest number (2,360) was in Michigan with only two in Mississippi. The distribution of active D.O.s among the States may well become more uneven within the next few years because in many States high proportions of these physicians are over 65. As a result of this uneven distribution, the ratios of active non-Federal osteopathic physicians per

(85/) Wennberg, J., and Gittlesohn, A., Small Area Variations in Health Care Delivery, Science, 182, December 1973, p. 1102.
(86/) Roback, G.A., Distribution of Physicians 1963, AMA, Chicago 1964.
(87/) Critical Health Manpower Shortage Areas Criteria and List, Federal Register, July 6, 1976.

TABLE 10

Patient Care Physicians (Non-Federal)
Office and Hospital Based

Specialty	M.D.s 100,000 U.S.A.	M.D.s 100,000 High States		M.D.s 100,000 Medium States		M.D.s 100,000 Low States	
General and Family Practice	25.0	N.Y.	23	Minn.	32	S.D.	27
		Mass.	20	N.J.	20	N.D.	27
		Md.	18	Ore.	28	Ala.	19
		Conn.	19	Penna.	25	Alaska	21
		Cal.	31	Wash.	31	Miss.	23
		Ave.	22	Ave.	27	Ave.	23
Internal Medicine	22.1	N.Y.	37	Minn.	22	S.D.	6
		Mass.	34	N.J.	22	N.D.	8
		Md.	27	Ore.	19	Ala.	11
		Conn.	32	Penna.	20	Alaska	7
		Cal.	24	Wash.	15	Miss.	8
		Ave.	31	Ave.	20	Ave.	8
Pediatrics	8.9	N.Y.	15	Minn.	6	S.D.	2
		Mass.	12	N.J.	10	N.D.	3
		Md.	13	Ore.	6	Ala.	6
		Conn.	12	Penna.	7	Alaska	5
		Cal.	10	Wash.	7	Miss.	4
		Ave.	12	Ave.	7	Ave.	4

Source: Physician Manpower and Distribution, A Report of the Coordinating Council of Medical Education, October 25, 1976.

TABLE 10(a)

Specialty	M.D.s 100,000 U.S.A.	M.D.s 100,000 High States		M.D.s 100,000 Medium States		M.D.s 100,000 Low States	
Obstetrics & Gynecology	9.5	N.Y.	14	Minn.	7	S.D.	3
		Mass.	10	N.J.	10	N.D.	4
		Md.	14	Ore.	8	Ala.	7
		Conn.	11	Penna.	9	Alaska	5
		Cal.	11	Wash.	8	Miss.	6
		Ave.	12	Ave.	8	Ave.	5
General Surgery	14.2	N.Y.	20	Minn.	12	S.D.	10
		Mass.	18	N.J.	14	N.D.	8
		Md.	16	Ore.	13	Ala.	10
		Conn.	17	Penna.	13	Alaska	7
		Cal.	14	Wash.	12	Miss.	10
		Ave.	17	Ave.	13	Ave.	9
Psychiatry	9.7	N.Y.	20	Minn.	5	S.D.	1
		Mass.	17	N.J.	9	N.D.	3
		Md.	15	Ore.	6	Ala.	2
		Conn.	15	Penna.	8	Alaska	4
		Cal.	13	Wash.	8	Miss.	3
		Ave.	16	Ave.	7	Ave.	3
Ophthalmology	4.9	N.Y.	6	Minn.	5	S.D.	2
		Mass.	6	N.J.	5	N.D.	2
		Md.	6	Ore.	6	Ala.	3
		Conn.	6	Penna.	5	Alaska	1
		Cal.	6	Wash.	5	Miss.	3
		Ave.	6	Ave.	5	Ave.	2

TABLE 10(b)

Specialty	M.D.s 100,000 U.S.A.	M.D.s 100,000 High States		M.D.s 100,000 Medium States		M.D.s 100,000 Low States	
Orthopedic Surgery	5.1	N.Y.	5	Minn.	5	S.D.	3
		Mass.	6	N.J.	4	N.D.	3
		Md.	4	Ore.	7	Ala.	3
		Conn.	6	Penna.	4	Alaska	4
		Cal.	7	Wash.	6	Miss.	3
		Ave.	6	Ave.	5	Ave.	3
Urology	3.0	N.Y.	4	Minn.	3	S.D.	2
		Mass.	3	N.J.	3	N.D.	2
		Md.	3	Ore.	3	Ala.	2
		Conn.	3	Penna.	3	Alaska	1
		Cal.	3	Wash.	3	Miss.	1
		Ave.	3	Ave.	3	Ave.	2
Anesthesiology	5.6	N.Y.	8	Minn.	4	S.D.	1
		Mass.	9	N.J.	6	N.D.	2
		Md.	6	Ore.	7	Ala.	3
		Conn.	7	Penna.	5	Alaska	2
		Cal.	8	Wash.	7	Miss.	2
		Ave.	8	Ave.	6	Ave.	2
Pathology	4.4	N.Y.	5	Minn.	4	S.D.	3
		Mass.	5	N.J.	4	N.D.	2
		Md.	5	Ore.	4	Ala.	2
		Conn.	5	Penna.	4	Alaska	2
		Cal.	4	Wash.	4	Miss.	3
		Ave.	5	Ave.	4	Ave.	2

TABLE 10(c)

Specialty	M.D.s 100,000 U.S.A.	M.D.s 100,000 High States		M.D.s 100,000 Medium States		M.D.s 100,000 Low States	
Radiology	5.1	N.Y.	8	Minn.	4	S.D.	3
		Mass.	10	N.J.	4	N.D.	6
		Md.	6	Ore.	4	Ala.	5
		Conn.	8	Penna.	5	Alaska	3
		Cal.	9	Wash.	4	Miss.	4
		Ave.	8	Ave.	4	Ave.	4
Surgical Specialties	33.3	N.Y.	43	Minn.	37	S.D.	19
		Mass.	39	N.J.	41	N.D.	20
		Md.	34	Ore.	44	Ala.	23
		Conn.	39	Penna.	39	Alaska	19
		Cal.	38	Wash.	39	Miss.	20
		Ave.	39	Ave.	40	Ave.	20
Other Specialties	37.0	N.Y.	56	Minn.	32	S.D.	13
		Mass.	52	N.J.	34	N.D.	18
		Md.	34	Ore.	32	Ala.	15
		Conn.	48	Penna.	35	Alaska	14
		Cal.	45	Wash.	35	Miss.	14
		Ave.	49	Ave.	34	Ave.	15

TABLE 11

Non-Federal physicians (M.D.) providing patient care in metropolitan and nonmetropolitan areas 1963-74

Year	Number of physicians		
	All counties	Metropolitan 1/	Non metropolitan 1/
1963....	225,427	178,403	47,024
1964....	232,067	184,298	47,769
1965....	239,482	189,211	48,271
1966....	241,473	192,871	48,602
1967....	247,256	200,880	46,376
1968.. 2/	236,458	192,242	44,216
1969....	245,368	200,247	45,121
1970....	252,778	206,676	46,102
1971....	261,335	217,187	44,148
1972....	266,587	225,424	41,163
1973....	270,412	231,529	38,883
1974....	276,070	235,994	40,076

Year	M.D.s per 100,000 population		
	All counties	Metropolitan	Nonmetropolitan
1963....	120.3	144.2	73.8
1964....	122.0	146.8	73.9
1965....	123.2	148.7	73.6
1966....	123.7	148.9	74.1
1967....	125.4	150.0	73.3
1968.. 2/	118.7	141.6	69.7
1969....	121.8	145.7	70.5
1970....	124.2	148.7	71.5
1971....	127.5	152.9	70.1
1972....	128.5	152.9	68.6
1973....	129.1	150.9	69.4
1974....	130.9	153.3	70.4

TABLE 11 (con't)

Year	Percent of M.D.s		
	All counties	Metropolitan	Nonmetropolitan
1963....	100.0	79.1	20.9
1964....	100.0	79.4	20.6
1965....	100.0	79.7	20.3
1966....	100.0	79.9	20.1
1967....	100.0	81.2	18.8
1968.. 2/	100.0	81.3	18.7
1969....	100.0	81.6	18.4
1970....	100.0	81.8	18.2
1971....	100.0	83.1	16.9
1972....	100.0	84.6	15.4
1973....	100.0	85.6	14.4
1974....	100.0	85.5	14.5

1/ For 1963-66, metropolitan counties include those in SMSAs on basis of 1962 population and nonmetropolitan counties include those adjacent to metropolitan counties and isolated rural and semi-rural counties.

For 1967-74, metropolitan counties include those in SMSAs on basis of 1967 population and nonmetropolitan counties include potential metropolitan counties and all others outside SMSAs.

2/ Beginning in 1968, the AMA changed its method of classifying physicians to reflect the number of hours spent in various activities and specialties. This resulted in a loss in physicians in patient care with corresponding increases in physicians in "other activities" and inactive.

Source: Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association.

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civilian population range from 0.1 per 100,000 in Mississippi to 26 per 100,000 in Michigan with the U.S. average being 6.4 per 100,000.(88/) However, within the States in which D.O.s are concentrated they are relatively evenly distributed among communities of different size. Similarly, the specialty distribution of active non-Federal D.O.s also tends to be fairly even among communities of various sizes.(89/)

Locational Patterns of Foreign Medical Graduates

Foreign Medical Graduates gravitate towards the highly urbanized centers of the country to a greater extent than U.S. medical graduates. Almost half of all FMGs are located in only five States. Of the total active FMGs only 7 percent practice in non-metropolitan areas compared with 14 percent of U.S. medical graduates. By the end of 1973, 19 percent of M.D.s actively engaged in practice were foreign medical graduates, the proportion in urban counties being twice that in rural counties. In SMSAs of greater than 5 million population, nearly one-third of the M.D.s were foreign medical graduates while the proportion in smaller SMSAs more nearly reflects the overall proportion of foreign medical graduates to the total of physician population.

Thus, patterns discerned at the national level indicate that foreign medical graduates are not improving the unequal geographic distribution of physicians. However, if the geographic data are disaggregated to the county level of analysis, one can see sizeable variations in the extent to which foreign medical graduates located in metropolitan areas. In at least eight States, larger proportions of foreign medical graduates are located in non-metropolitan areas than in metropolitan areas. In most of these States this is true for office-based as well as hospital-based FMGs in contrast to the urban-rural distribution observed at the national level. At the same time, at least one-half of these States have physician population ratios which rank among the lowest in the country.(90/) Furthermore, a recent comparative study of the distribution of U.S. and foreign trained physicians in Maryland revealed foreign trained physicians to be more evenly distributed than U.S. trained physicians.(91/)

Quantification of Geographic Distribution of Physicians

The National Health Planning and Resources Development Act of 1974 (P.L. 93-641) designated Health Service Areas (HSAs) as the Nation's local health planning units. An analysis of the geographic distribution of primary care physicians and surgeons was performed by the Division of Medicine, Bureau of Health Manpower, with the HSA as the unit of analysis. The analysis aimed to show both how each HSA's share of physicians compared with

(88/) Crowley, A., Communication from the American Association of Colleges of Osteopathic Medicine.

(89/) Op. cit., Altenderfer, M.D., Osteopathic Physicians in the U.S.

(90/) Socioeconomic Issues of Health 1975-76, American Medical Association, Chicago, 1976.

(91/) Politizer, R.M., A Comparison of the Location and Specialty Distribution of Foreign and American Medical Graduates in Maryland, Johns Hopkins University, Baltimore, Maryland, May 1976.

its share of the Nation's population and how the local availability of physicians varied nationwide. In developing this profile of physician distribution, a methodology is presented to calculate physician availability indices for each HSA using two proportions: the ratio of physicians available in each HSA to the Nation's total number of physicians and the ratio of the HSA's population to the Nation's total population.

In previous analyses, the magnitude of uneven distribution was quantified in one of two ways: either by calculating a single number index of the degree of unequal distribution throughout the Nation or by examining the physician to population ratios of the 3,200 U.S. counties. For example, the Gini Index is a single number type indicator of the variation in distribution of a given item nationwide. It was developed as an index of national economic distribution. Its strength lies in its ability to demonstrate change (as in income distribution) over time, generally over several years, for a system like the economy where it can be assumed that changes will be incremental and continuous. The Gini Index, as adapted to measure variation in geographic distribution of physicians, aggregates the physician to population ratios of the Nation's counties to a single number between 0 and 1.(92/) A Gini Index of 0 would represent equal distribution or no maldistribution while an index of 1 would occur if all the Nation's physicians were found in a single county.

The primary shortcoming of the Gini Index in describing equality or inequality of distribution is that, being just one number, it does not convey any impression of the variation in distribution among the sub-areas of the country. For instance, uniform maldistribution in many counties would produce the same Gini Index as severe maldistribution in some counties and little or none in others.(93/)

The other way in which physician distribution has been quantified, by comparing the physician to population ratios of the Nation's 3,200 counties is cumbersome because of the large numbers involved. In addition, it has one major drawback--the county is not a meaningful unit for analyzing the availability of health manpower because county boundaries rarely coincide with the boundaries of a rational health service area. 94/) Consequently, the population of a county normally has access to either more or fewer physicians than just the pool of physicians practicing in that county. Except on rare occasions, it will be difficult for a county which has less than its share of health care resources to mobilize its administrative structures to develop linkages to those organizational units which can help in attracting the resources needed.

In contrast, the HSAs have both the required administrative linkages and the mandate to deal with the problem of physician distribution. This section describes a method of calculating and displaying the distribution of physicians by HSA across the Nation. This proposed methodology first calculates physician availability indices for each of the Nation's 204 HSAs and then

(92/) Gastwirth, J.L., The Estimation of Lorenz Curve and Gini Index. The Review of Economics and Statistics, August 1972, p. 306-316.

(93/) BHM/OPD/MAB Report No. 76-25. Geographic Distribution of Selected Health Occupations.

(94/) The delineations of Economic and Health Service Areas. Final Report DM Contract 72-4083, University of Wyoming.

aggregates these indices in a histogram to show the profile of the nationwide geographic distribution of physicians. If this distribution is wide, then it can be said that maldistribution exists.

The availability index (I) for each HSA is a weighted average of the ratio between the portion of the Nation's physicians in each of the HSA's counties and portion of the Nation's population living in each of those counties. That is, if the HSA has attracted a portion of the Nation's physicians equivalent to its portion of the Nation's population, its physician availability index would be 1.0. In the exercise presented here, separate calculations were made for primary care physicians and for surgeons (including obstetrics and gynecology.)

In Figure 1, 1973 data are used to show the distribution of I, the physician availability index for each HSA, along an interval scale from shortage to overattraction of physicians. At that position in the figure where I = 1, the histogram is divided between those HSAs with less than their equivalent share of the Nation's physicians and those with more. The dotted bars of the histogram show the number of HSAs having an index for primary care physicians in the interval shown at the base of those bars; the cross-hatched bars show the same information for surgeons. For example, 39 HSAs have the same or only slightly more than their equivalent share of the Nation's physicians. Thirty HSAs have an availability index for surgeons of between .4 and .59; these HSAs have a much smaller portion of the Nation's surgeons than their portion of the Nation's population.

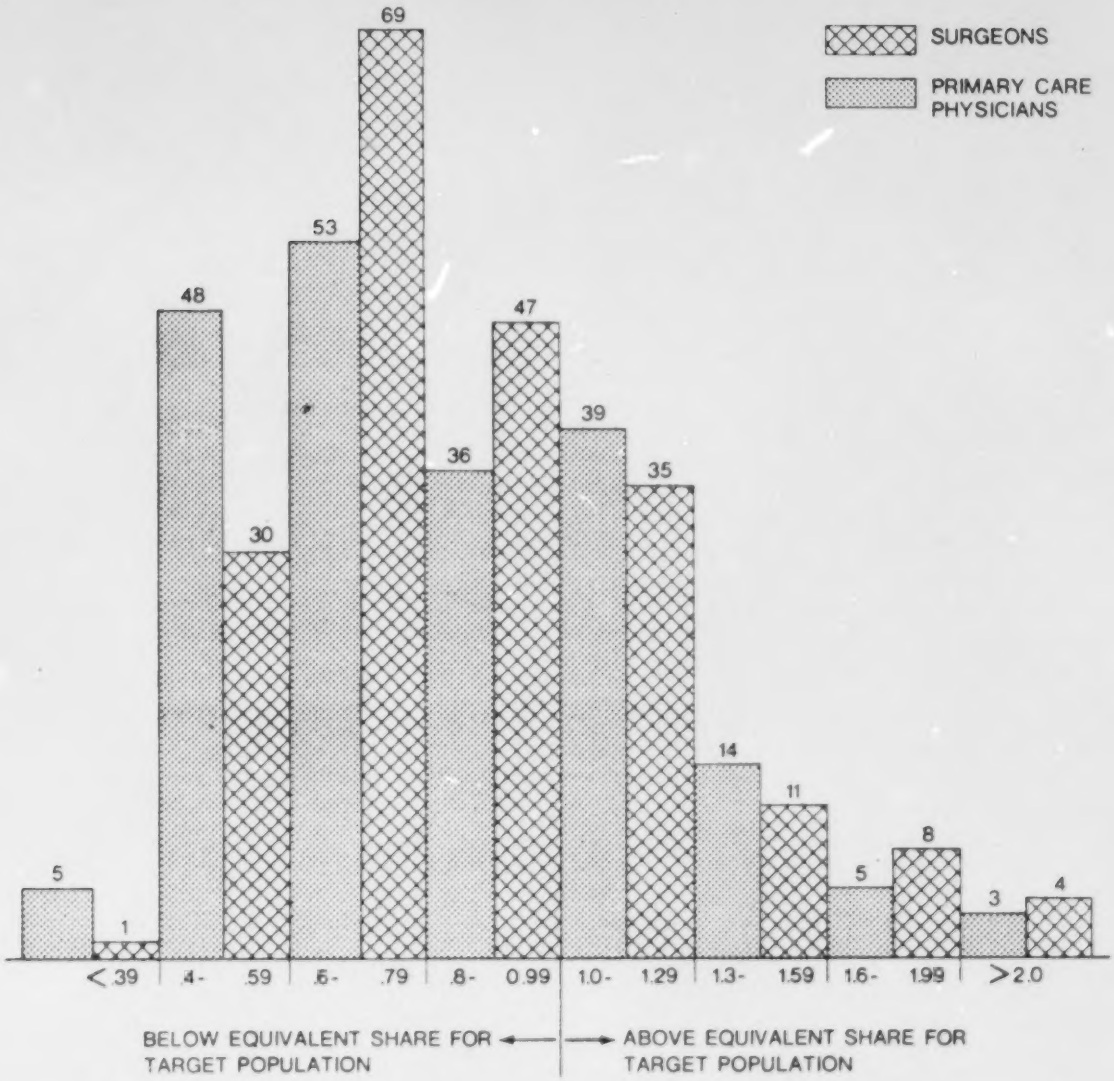
For both primary care physicians and surgeons, more than twice as many HSAs (142 for primary care, 147 for surgeons) have less than their equivalent share of providers than those which have more than their equivalent share (61 for physicians, 58 for surgeons). Also, more than six times as many HSAs are faced with much less than their share of primary care physicians and surgeons (53 HSAs had availability indices less than or equal to .59) than are faced with much more than their share (8 HSAs had indices greater than or equal to 1.6). The availability index has a mean of .8, standard deviation of .34, and varies between .47 and 2.69.

This method of displaying the Nation's physician distribution meets the basic needs for policymaking aimed at alleviating any maldistribution of physicians in the U.S. The method provides a measure of the global problem, if one exists, and also shows enough detail of the variation among subsections of the country to help health resource planners identify important loci of the problem. However, a physician availability index deals only with the relative distribution of the physicians available and not with the adequacy of physician supply or physician services in absolute terms. It is important to emphasize that this view of the distribution problem considers only gross numbers of physicians and populations, not the important issues of access to physicians, productivity of physicians, or physician utilization.

Locational Patterns of Physician Extenders

In view of the uneven distribution of physicians, it is important to examine the distribution of physician extenders in order to assess how they contribute to the general distribution of health manpower. Physician assistants and

Figure 1 **Frequency distribution of physician availability indices - primary care physicians and surgeons for the 204 HSA's.**



Medex are distributing themselves throughout the country, with each of the 50 States having at least some in practice. The greatest number are concentrating in the larger States or in States that have older and well-established programs. Nearly 80 percent of the physician extender respondents to a survey conducted in March 1975, indicated a practice location with a primary care physician. In addition, these physician assistants to the primary care physician tended to locate in non-metropolitan counties with less than 50,000 population in proportions far greater than the percent of the resident primary care physician population of these counties. Among the types of physician assistants, 54.9 percent of the Medex were located outside the metropolitan SMSA as compared to 31.1 percent of the two-year physician assistants.(95/)(96/)

Survey data on graduates of formal nurse practitioner training programs indicate that like PAs, they are distributing themselves in areas currently undersupplied with physicians. About one-third of the nurse practitioners are employed in inner city areas and another 20 percent in other urban areas; 16 percent in rural areas and only 10 percent in suburban areas. In addition, they appear to be evenly distributed throughout the regions of the country.(97/)

Thus, physician extenders appear to be locating in areas currently undersupplied with physician manpower and, despite their small number, are serving to ameliorate the unequal geographic distribution of health services. It is not certain that these distribution patterns will prevail in the future.

Determinants of Career and Geographic Choices

In view of the disparities exhibited in physician distribution, as described in this paper, it is interesting to look at factors which may have predisposed physicians to choose particular specialties and to practice in specific geographic locations. Significant numbers of studies have been conducted which have focused on these factors. The objectives of such research have been to develop admissions criteria and supportive curricula to increase the likelihood that students would be more disposed to make specialty and geographic choices in shortage areas. Presently, medical students are a remarkably homogeneous group of high achievers with similar intellectual and social outlooks.(98/) Thus, they are more likely to continue the existing patterns of physician specialty and geographic choice.

The predictive factors gleaned from the determinants of research efforts on career and geographic choice, although not definitive, are related to sociodemographic, medical school environment, psychological and community variables. For example, medical students who appear predisposed to general practice are characterized sociodemographically as: (1) those who are

(95/) Scheffler, R.M., Preliminary Data Project on the Status of Physicians Assistants and Medex, University of North Carolina, Chapel Hill, North Carolina, February 1976.
(96/) Op. cit., Roback C., and Mason, E.P.
(97/) State University of New York at Buffalo, Preliminary Survey: Results of Nurses in Extended Roles, October 1976.
(98/) Elam, L.C., "New Resources for Health Manpower," in Judy Graves, ed., The Future of Medical Education, North Carolina, 1973.

relatively older and have larger families; (2) those whose fathers have lower status occupations; (3) those who receive lower scores on their Medical College Admissions Test; (4) those who have lower income expectations; and (5) those who come from smaller sized communities.(99/)(100/) It must be noted that while such students may be of "average" academic ability, such comparisons are being made within a highly selective acedemic environment, and those students choosing general practice are high performers in clinical rotations.

Research findings suggest that the following institutional variables impact on the student's selection of primary care: (1) faculty composition and presence of role models; (2) the nature of the curriculum; and (3) the nature of the research emphasized by the school.(101/)(102/) However, additional research is needed to determine how both the attributes of today's students and their educational experiences interact to determine specialty preferences.

Considerable research has been conducted to determine which factors affect students' locational choices. Yet, little is certain because of the conceptual and methodological limits of such research. Nevertheless, it appears that community of origin and medical specialty selected are significant predictors of probable geographic location.(103/) The research suggests that physicians who select small towns for general practice value their life styles to a greater extent than professional rewards. On the other hand, many physicians who choose to practice in an urban area appear to choose specialties which depend upon modern facilities and which permit them to obtain professional stimulation from the presence of colleagues. This is an oversimplification of the subjects of specialty and career choice and their determinants. A separate paper on this subject will be forthcoming from the Division of Medicine, in early summer, 1977.

(99/) Hadley, J., Discussion Paper Series, Physicians Specialty and Location Decisions: A Literature Review, Economic Analysis Branch, Social and Economic Analysis Division, NCHSRD, No. 10, May 1973.

(100/) CONSAD Research Corporation, Factors Affecting Specialty Choice and the Interrelationship Between Specialty Choice and Geographic Location, HEW-OS-73-142, October 10, 1973.

(101/) Kendall, P.L., Medical Specialization: Trends and Contributing Factors. Psychological Aspects of Medical Training, R.H. Coombs and C.E. Vincent (eds.), Cambridge, Massachusetts, Harvard University Press, 1957, 153-174.

(102/) Funkenstein, D.H., Medical Students, Medical Schools and Society During Three Years, R.H. Coombs and C.E. Vincent (eds.) 229-284. Psychological Aspects of Medical Training., op. cit., Funkenstein's data indicate that the mere presence of a primary care curriculum does not guarantee that students will choose careers in that field.

(103/) Cooper, J.K., et. al., The Decision for Rural Practice, Journal of Medical Education 47:939-944 (December 1972); and Cooper, J.K., Samuels M., and Coleman, S., Rural and Urban Practice: Factors Influencing the Location of Primary Care Physicians, Inquiry 18-25, (1975).

MEDICAL SPECIALIST SUPPLY PROJECTIONS

Having discussed the available data sources and their limitations and the current characteristics of medical specialists and physician extenders, it is important to look at the likely future supply of physician and physician extender manpower. In an ongoing effort the Bureau of Health Manpower's Manpower Analysis Branch (MAB) evaluates the future supply of health manpower in the various occupations. As part of this effort, preliminary M.D. specialist supply projections to 1990 are available.(104/)

These projections are derived essentially from two distinct estimation matrices, using the 1974 active supply of M.D.s by specialty as the starting point (see Table 12). The first matrix produces a "basic" projection of year-by-year future M.D. graduates and separations from the active workforce by country of medical education. The second matrix distributes the future graduates and separations by specialty, disaggregated by country of medical education. "High" and "low" estimates of aggregate physician supply have also been developed but are not included here. Comparable projections on osteopathic physicians have not yet been developed but should be available in the early Spring.

The first matrix projects graduates and foreign additions utilizing estimates of first-year enrollments, student attrition, other medical school-related trends, and a model of Foreign and Canadian Medical Graduate (FMG/CMG) immigration. The second matrix distributes the graduates among medical specialties through projections of first-year residency trends, and distributes deaths and retirements of active practitioners among the specialties proportionate to the supply in each specialty as of 1974.

Projections of the future specialty distribution of graduates based on trends in filled first-year residencies entail certain assumptions. For example, the assumption is made that M.D.s who take training in a given specialty will subsequently practice in that specialty, and be recorded as doing so by the AMA in their annual statistics on the numbers of active medical specialists. Actually, M.D.s do shift their specialty interests subsequent to their initial postgraduate training, but little is known about these shifts and the actual content of the specialists' practice. Additionally, the graduate medical education (GME) environment is in a fairly rapid state of flux. The "rotating", "shifting", and "duplicative" training slots being contemplated in the new "PG1" and "PG2" approach to graduate medical training will have unknown effects on the future specialty distribution of graduate training slots. The individual M.D.'s ability to direct the focus of his subsequent practice may also be affected.

Table 13 displays the preliminary "basic" 1990 projections of the supply of active M.D.s by country of medical education as of 1975, 1980, 1985 and 1990. These projections include a preliminary analysis of the expected effects of P.L. 94-484 in the projection period. The analysis indicated a substantial decline from previous years in FMG/CMG additions to the AMA pool, and a minor increase in the rate of acceptance of transferees from foreign medical schools into U.S. medical schools. The 1974 base year physician totals differ from

(104/) DHEW, Bureau of Health Manpower, Manpower Analysis Branch, Preliminary unpublished figures.

TABLE 12

Method of Estimation of Specialty Distribution for Active M.D.s
by Country of Education: 1974

Specialty	Active M.D.s		Country of Medical Education				
	AMA 3/	MAB 4/ "Basic Method"	Foreign 4/		Canadian 4/		U.S.
			number	percent	number	percent	number
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total active physicians....	330,266	348,961 5/	70,941	100.0 7/	5,645	100.0 7/	272,375
Primary care.....	126,431	133,588	24,207	34.1	1,678	29.7	107,703
General practice.....	53,997	47,566 6/	6,620	11.7	640	13.6	40,306
Family practice.....	-	9,487	1,649	-	128	-	7,710
General Internal medicine.....	51,752	54,682	10,908	15.5	649	11.5	43,035
General Pediatrics.....	20,682	21,853	4,940	7.0	261	4.6	16,652
Other medical specialties.....	17,485	18,475	3,019	4.3	300	5.3	15,156
Dermatology.....	4,479	4,733	444	0.6	78	1.4	4,211
Pediatric allergy.....	429	453	89	0.1	9	0.2	355
Pediatric cardiology.....	534	564	183	0.3	9	0.2	372
Internal medicine subspecialties 1/	12,043	12,725	2,303	3.2	204	3.6	10,218
Surgical specialties.....	93,386	98,672	16,884	23.8	1,721	30.5	80,067
General surgery.....	31,085	32,845	7,188	10.1	484	8.6	25,173
Neurological surgery.....	2,859	3,021	500	0.7	92	1.6	2,429
Obstetrics and gynecology....	20,987	22,175	4,312	6.1	371	6.6	17,492
Ophthalmology.....	10,741	11,349	1,008	1.4	221	3.9	10,120
Orthopedic surgery.....	10,985	11,607	1,137	1.6	221	3.9	10,249
Otolaryngology.....	5,588	5,904	815	1.1	128	2.3	4,961
Plastic surgery.....	2,088	2,206	312	0.4	45	0.8	1,849
Colon and rectal surgery.....	662	699	91	0.1	25	0.4	583
Thoracic surgery.....	1,925	2,034	473	0.7	33	0.6	1,528
Urology.....	6,466	6,832	1,048	1.5	101	1.8	5,683

TABLE 12 (con't)

Specialty	Active M.D.s		Country of Medical Education				
	AMA 3/	MAB 4/ "Basic Method"	Foreign 4/		Canadian 4/		U.S.
			number	percent	number	percent	number
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Other specialties.....	92,964	98,226	26,831	37.8	1,946	34.5	69,449
Anesthesiology.....	12,484	13,191	4,825	6.8	272	4.8	8,094
Neurology.....	3,839	4,056	923	1.3	111	2.0	3,022
Pathology.....	11,393	12,037	4,344	6.1	225	4.5	7,438
Forensic Pathology.....	198	209	59	0.1	4	0.1	146
Psychiatry.....	23,302	24,621	6,345	8.9	558	9.9	17,718
Child psychiatry.....	2,411	2.547	562	0.8	70	1.2	1,915
Physical medicine and rehabilitation.....	1,610	1,701	668	0.9	33	0.6	1,000
Radiology.....	11,600	12,256	2,017	2.8	191	3.4	10,048
Diagnostic radiology.....	3,083	3,258	592	0.8	37	0.6	2,629
Therapeutic radiology.....	1,070	1,131	329	0.5	20	0.4	782
Miscellaneous 2/.....	21,974	23,219	6,167	8.7	395	7.0	16,657

1/ Includes gastroenterology, pulmonary disease, allergy, and cardiovascular disease.

2/ Includes occupational medicine, general preventive medicine, aerospace medicine, public health, "other", and unspecified.

3/ A.M.A. "professionally active" physicians as of December 31, 1974. Physician Distribution and Medical Licensure in the U.S., 1974. American Medical Association, Chicago, 1975.

4/ M.A.B. number of active M.D.s and the total number of FMGs from Table 1. The number of active CMGs is 2.03%: (total active physicians less the number of FMGs).

5/ M.A.B. distribution by specialty developed by applying A.M.A. specialty distribution percentages to M.A.B. active total which includes 18,695 physicians not classified by the A.M.A.

TABLE 12 (con't)

6/ Number of family practitioners (9,487) - 7,018 board certified FPs as of December 31, 1974 plus 2,459 FYRs in family practice in years 1972 thru 1974.

7/ Percent distributions in cols. 4 and 6 from Medical School Alumni, 1973. Col. 4 x 70,941 - col. 3 distribution. Col. 6 x 5,645 - col. 5 distribution. Col. 7 - col 2 - col. 3 - col. 5.

Sources: American Medical Association. Directory of Approved Internships and Residencies, yearly editions 1972 thru 1974. Chicago.

_____. Profiles of Medical Practice, 1975. Chicago, 1976.

_____. Physician Distribution and Licensure in the U.S., 1974. Chicago, 1975.

_____. Medical School Alumni, 1973. Aspen Systems Corporation, Rockville, Maryland. The Association, 1975.

Source: The Supply of Medical Specialists — Preliminary Projections to 1990/ BHM/OPD/MAB 11/15/76. Report No. 77-27, Preliminary Draft.

TABLE 13

Supply of active M.D.s by country of medical education
using basic methodology: Actual 1974; Projected 1975-90

Category	1974	1975	Year 1980	1985	1990
	Number of active M.D.s				
All active M.D.s.....	349,000	361,300	428,400	493,800	559,800
U.S. trained M.D.s.....	272,400	281,600	336,200	399,800	462,900
Canadian-trained M.D.s....	5,600	5,600	6,100	6,200	6,400
Foreign-trained M.D.s.....	70,900	74,000	86,000	87,900	90,600
	Rate per 100,000 population				
All active M.D.s.....	164.8	169.3	192.3	211.0	228.4
U.S. trained M.D.s.....	128.5	132.0	151.0	170.7	188.9
Canadian-trained M.D.s...	2.6	2.6	2.7	2.7	2.6
Foreign-trained M.D.s....	33.5	34.7	38.6	37.5	37.0

Sources: 1974: M.D.s; see Table 11
Population; U.S. Bureau of the Census, Current Population Reports. Series P-25, No. 635 for July 1, 1974.

1975-1990: M.D.s; see text for methodology and assumptions.
Population; U.S. Bureau of the Census. Projections of the Population of the United States. 1975-2050. Series P-25, No. 601. Series II Projections.

the "professionally active" totals in AMA data. MAB estimates that a number of "not classified" M.D.s, which the AMA calls "inactive", should actually be counted in the active totals judging from data on their age distribution.

Projections of active M.D.s were made utilizing the following methodology: Medical graduates were estimated by projecting medical school first-year enrollments to the year 1986-87 and combining them with enrollment attrition rates and three year program trends. The first-year enrollment projections were based on studies of the effects of Federal capitation grants, construction grants, new schools, and local and State funding. Foreign and Canadian medical graduates were projected using a cohort model of FMG and CMG immigration by type of visa and preference category accompanied by a detailed analysis of the potential impact of current legislation affecting FMGs. Since estimation of the anticipated effect of the legislative changes involves significant uncertainty, the results were computed in ranges, and the mid-range figure was used in this "basic" projection. Mortality and retirement losses were computed by five-year age cohort on an annual basis, using age distributions and mortality and retirement rates from AMA data.

Though a great deal of detailed analysis went into the estimates of the components of the first matrix enumerated above, space does not permit a more detailed summary here.

The projections indicate that while there were 349,000 active M.D.s in 1974, there are expected to be 559,800 in 1990, with the active physician to population ratio increasing from 164.8 per 100,000 population in 1974 to 228.4 in 1990.

Table 14 displays the filled first-year residency distribution in 1974, by country of education, as reported by the AMA. Adjustments were made to this distribution to account for duplication in the AMA figures caused by some physicians taking a first-year residency in a general area and subsequently taking a second "first-year" residency in a more specialized area. This adjustment was performed for internal medicine, pediatrics, general surgery, psychiatry, and pathology.

Table 15 displays the relationship of the specialty distribution of the 1974 active supply to the specialty distribution of the 1974 adjusted first-year residencies.

It should be noted at this point that active M.D.s in the various specialties exhibit substantially different age distributions. Although comprehensive data on these specialty age distributions are not currently available, the age distribution of active general practitioners has been estimated. As a result, the specialty projections which are presented here reflect a distribution of losses due to death and retirement proportionate to the supply in each specialty rather than according to its own age distribution. Thus, the projections are biased in the direction of higher numbers of primary care "marker" specialties (general practice, family practice, primary pediatrics, and primary internal medicine). General practitioners exhibit an average annual loss rate that is 1.7 times greater than that for all active M.D.s. The G.P. losses implied by the projections over the 1974-1990 period are 12,300 M.D.s, as compared with the 21,500 losses that would have resulted

TABLE 14

First-year residency distribution with sub-specialty adjustment: September 1, 1974

Specialty	AMA 3/				Adjustments		Adjusted AMA			
	USMGs/CMGs		FMGs		USMGs/CMGs	FMGs	USMGs/CMGs		FMGs	
	Number	Percent	Number	Percent	Number	Number	Number	Percent	Number	Percent
Total active physicians....	13,618	100.0	5,216	100.0			12,626	100.0	4,755	100.0
Primary care.....	5,978	43.9	1,746	33.5			4,735	37.5	1,394	29.3
General practice.....	23	0.2	139	2.7			23	0.2	139	2.9
Family practice.....	1,131	8.3	68	1.3			1,131	9.0	68	1.4
Internal medicine.....	3,591	26.4	962	18.4	-1,144	-306 4/	2,447	19.4	656	13.8
Pediatrics.....	1,233	9.1	577	11.1	- 99	- 46 5/	1,134	9.0	531	11.2
Other medical specialties.....	335	2.5	46	0.8			1,155	9.1	266	5.6
Dermatology.....	248	1.8	16	0.3			248	2.0	16	0.3
Pediatric allergy.....	46	0.3	13	0.2			46	0.4	13	0.3
Pediatric cardiology.....	41	0.3	17	0.3			41	0.3	17	0.4
Internal medicine subspecialties 1/	-	-	-	-	+ 820	+220 6/	820	6.5	220	4.6
Surgical specialties.....	4,398	32.3	1,454	27.9			3,280	26.0	936	19.7
General surgery.....	1,803	13.2	836	16.0	-1,118	-518 7/	685	5.4	318	6.7
Neurological surgery.....	114	0.8	15	0.3			114	0.9	15	0.3
Obstetrics and gynecology....	742	5.5	288	5.5			742	5.9	288	6.1
Ophthalmology.....	468	3.5	36	0.7			468	3.7	36	0.8
Orthopedic surgery.....	547	4.0	62	1.2			547	4.3	62	1.3
Otolaryngology.....	227	1.7	43	0.8			227	1.8	43	0.9
Plastic surgery.....	148	1.1	36	0.7			148	1.2	36	0.8
Colon and rectal surgery....	20	0.1	10	0.2			20	0.2	10	0.2
Thoracic surgery.....	97	0.7	50	1.0			97	0.8	50	1.1
Urology.....	232	1.7	78	1.5			232	1.8	78	1.6

TABLE 14 (con't)

Specialty	AMA 3/				Adjustments		Adjusted AMA			
	USMGs/CMGs		FMGs		USMGs/CMGs	FMGs	USMGs/CMGs		FMGs	
	Number	Percent	Number	Percent	Number	Number	Number	Percent	Number	Percent
Other specialties.....	2,907 8/	20.8	1,970	37.8			3,456	27.4	2,159	45.4
Anesthesiology.....	367	2.7	348	6.7			367	2.9	348	7.3
Neurology.....	272	1.2	109	2.1			252	2.0	109	2.3
Pathology.....	397	2.9	410	7.9	- 11	- 11 9/	386	3.1	399	8.4
Forensic pathology.....	17	0.1	7	0.1			17	0.1	7	0.1
Psychiatry.....	952	7.0	612	11.7	- 180	-116 10/	771	6.1	496	10.4
Child psychiatry.....	189	1.4	98	1.9			189	1.5	98	2.1
Physical medicine and rehabilitation.....	29	0.2	93	1.8			29	0.2	93	2.0
Radiology.....	88	0.7	137	2.6			88	0.7	137	2.9
Diagnostic radiology.....	452	3.3	101	1.9			452	3.6	101	2.1
Theopeutic radiology.....	65	0.5	55	1.1			65	0.5	55	1.2
Miscellaneous 2/.....	-	-	-	-	+ 840	+316 11/	840	6.7	316	6.7

1/ Includes gastroenterology, pulmonary disease, cardiovascular disease, and allergy.

2/ Includes aerospace medicine, public health, general preventive medicine, occupational medicine, "other", and unspecified.

3/ Pre-publication data from the American Medical Association.

4/ Nine percent of 4,553 (3,591 plus 962) is 410. Twenty-five percent of 4,143 (4,553 minus 410) is 1,040; 1,144 is 3,591 divided by 4,553 times 1,450 (410 plus 1,040); 306 is the residual. For explanation of 9 percent and 25 percent adjustments, see text of Table 11 Source.

5/ 1974 FYRs in pediatric allergy and pediatric cardiology (117) divided by 1973 FYRs in pediatrics (1,699) is 6.9 percent, the proportion subtracted out of the 1974 FYRs in pediatrics.

TABLE 14 (con't)

6/ 1,040 figure from footnote # 4.

7/ 1974 FYRs (1,679) in surgical subspecialties (excluding obstetrics/gynecology, and ophthmology) divided by 1973 FYRs (2,698) in general surgery is 62 percent, the proportion subtracted out of the 1974 FYRs in general surgery.

8/ This total includes nuclear medicine (53-3%) and neuropathology (26-2%) not reported separating in the listing of other specialties.

9/ 1974 FYRs (24) in forensic pathology divided by 1973 FYRs (898) in pathology is 2.7 percent, the proportion subtracted out of the 1974 FYRs in pathology.

10/ 1974 FYRs (287) in child psychiatry divided by the 1973 FYRs (1,472) in psychiatry is 20 percent, the proportion subtracted out of the 1974 FYRs in psychiatry.

11/ For explanation, see text.

Source: Pre-publication and unpublished data from the American Medical Association.

TABLE 15

Percent distribution of active physicians (M.D.) and of first-year residents, by specialty and country of graduation from medical school: 1974

Specialty	Active physicians (M.D.)				First-year residents		
	Total	U.S. medical graduates	Canadian medical graduates	Other foreign medical graduates	Total	U.S. and Canadian medical graduates	Other foreign medical graduates
Total active physicians.....	348,961	272,375	5,645	70,941	17,381	12,626	4,755
Percent of active physicians..	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary care.....	38.3	39.5	29.7	34.1	35.3	37.5	29.3
General practice.....	13.6	14.8	11.3	9.3	0.9	0.2	2.9
Family practice.....	2.7	2.9	2.3	2.3	6.9	9.0	1.4
Internal medicine.....	15.7	15.8	11.5	15.5	17.9	19.4	13.8
Pediatrics.....	6.3	6.1	4.6	7.0	9.6	9.0	11.2
Other medical specialties.....	5.3	5.6	5.3	4.3	8.2	9.1	5.6
Dermatology.....	1.4	1.5	1.4	0.6	1.5	2.0	0.3
Pediatric allergy.....	0.1	0.1	0.2	0.1	0.3	0.4	0.3
Pediatric cardiology.....	0.2	0.1	0.2	0.3	0.3	0.3	0.4
Internal medicine subspecialties 1/	3.6	3.8	3.6	3.2	6.0	6.5	4.6
Surgical specialties.....	28.3	29.4	30.5	23.8	24.3	26.0	19.6
General surgery.....	9.4	9.2	8.6	10.1	5.8	5.4	6.7
Neurological surgery.....	0.9	0.9	1.6	0.7	0.7	0.9	0.3
Obstetrics and gynecology.....	6.4	6.4	6.6	6.1	5.9	5.9	6.0
Ophthalmology.....	3.3	3.7	3.9	1.4	2.9	3.7	0.8
Orthopedic surgery.....	3.3	3.8	3.9	1.6	3.5	4.3	1.3
Otolaryngology.....	1.7	1.8	2.3	1.1	1.6	1.8	0.9
Plastic surgery.....	0.6	0.7	0.8	0.4	1.1	1.2	0.8
Colon and rectal surgery.....	0.2	0.2	0.4	0.1	0.2	0.2	0.2
Thoracic surgery.....	0.6	0.6	0.6	0.7	0.9	0.8	1.0
Urology.....	2.0	2.1	1.8	1.5	1.8	1.8	1.6

TABLE 15 (con't)

Specialty	Active physicians (M.D.)				First-year residents		
	Total	U.S. medical graduates	Canadian medical graduates	Other foreign medical graduates	Total	U.S. and Canadian medical graduates	Other foreign medical graduates
Other specialties.....	28.1	25.5	34.5	37.8	32.3	27.4	45.7
Anesthesiology.....	3.8	3.0	4.8	6.8	4.1	2.9	7.3
Neurology.....	1.2	1.1	2.0	1.3	2.1	2.0	2.3
Pathology.....	3.4	2.7	4.5	6.1	4.5	3.1	8.4
Forensic pathology.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Psychiatry.....	7.1	6.5	9.9	8.9	7.3	6.1	10.4
Child psychiatry.....	0.7	0.7	1.2	0.8	1.7	1.5	2.1
Physical medicine and rehabilitation.....	0.5	0.4	0.6	0.9	0.7	0.2	2.0
Radiology.....	3.5	3.7	3.4	2.8	3.2	0.7	2.9
Diagnostic radiology.....	0.9	1.0	0.6	0.8	3.2	3.6	2.1
Therapeutic radiology.....	0.3	0.3	0.4	0.5	0.7	0.5	1.2
Miscellaneous 2/.....	6.7	6.1	7.0	8.7	6.7	6.7	6.7

1/ Includes gastroenterology, pulmonary disease, cardiovascular disease, and allergy.

2/ Includes aerospace medicine, public health, general preventive medicine, occupational medicine, "other", and unspecified.

if active specialist age distributions had been available. The impact of these losses to general practice have been discussed earlier in this paper. (Estimates of age-adjusted losses for all specialties are not being refined and should be available shortly.)

Table 16 displays an illustrative projection of active medical specialists by major specialty group, based on holding the 1974 first-year residency distribution constant. In this projection, which is presented only as an illustration of what would occur if no changes took place in the current distribution of residencies, the number of primary care specialists declines from 38.3 percent of all active M.D.s in 1974 to 37.4 percent in 1990. The surgical specialties also show a decline, while the other medical specialties and "other" specialties (AMA-defined) are projected to claim a greater proportion of all active M.D.s.

As mentioned earlier, recent trends as well as anticipated changes in the GME environment portend major shifts in the future specialty distributions of GME training slots. Table 17 displays an illustrative projection based on an extrapolation of shifts in first-year residencies (FYR) for the years 1967-68 through 1973-74. In a relatively rigid statistical approach, each specialty was projected to continue its individual linear, curvilinear, logistic, or other recent pattern to 1980, at which point the distribution was held constant to 1990. The year 1980 was chosen as the final extrapolative year because historical data were available only for a six-year period (in most instances) and standard regression techniques do not support extrapolation beyond the number of observations contained in the historical data on which the extrapolations were based.

In contrast to the specialty projections described earlier in which the 1974 first-year residency distribution was held constant through the projection period, this more appropriate trend projection indicates that the primary care "marker" specialties are expected to claim an ever increasing share of the supply of active M.D.s climbing from 38.3 percent in 1974 to 46.0 percent in 1990 (see Table 18). In this trend projection, increase in the proportion of primary care manpower vis-a-vis total physician manpower in large part reflects the recent changes in specialty preference of physicians entering graduate training from non-primary care specialties to primary care specialties. This is also related in part to the greatly publicized claims of shortages in primary care and Federal support of family practice. These trend projections also indicate that "other medical specialties" will increase from 5.3 percent in 1974 to 6.0 percent in 1990, and that the surgical specialties and "other" specialties will show declines (see Table 19).

It seems evident that the historical decline in the number of primary care specialists, which continues to be reflected in AMA data, will probably reverse itself in the near future and the proportion should begin to climb. On the other hand, it cannot be stated authoritatively that primary care specialists will comprise 46 percent of all active M.D.s in 1990 (or 50 percent if obstetrics and gynecology is included). It has not been demonstrated that the GME environment, which is primarily a hospital environment, can or will accomodate the increases in the primary care training slots necessitated by such a change in residency composition. For example, these projections imply that 56.1 percent of the 18,350 U.S. and Canadian first-year residents

TABLE 16

Active M.D.s by major specialty group:
Actual 1974; Illustrative Projections, 1975-1990

Specialty group	1974	1975	1980	1985	1990
	Number of active M.D.s				
Total.....	348,960	361,300	428,360	493,830	559,820
Primary care.....	133,590	137,870	161,550	185,360	209,190
Other medical specialties..	18,480	19,640	26,140	33,010	40,030
Surgical specialties.....	98,670	101,540	117,420	133,370	149,250
Other specialties.....	98,230	102,250	123,260	142,100	161,360
	Percent distribution				
Total.....	100.0	100.0	100.0	100.0	100.0
Primary care.....	38.3	38.2	37.7	37.5	37.4
Other medical specialties.	5.3	5.4	6.1	6.7	7.2
Surgical specialties.....	28.3	28.1	27.4	27.0	26.7
Other specialties.....	28.1	28.3	28.8	28.8	28.8

Sources: 1974: see tables 11 and 14
1975-90: see text for methodology and assumptions.

Note: Figures may not add to totals due to independent rounding.

TABLE 17

First-year residency percent distribution by country of medical education: Unadjusted 1967, 1970, 1972 and 1974.

Specialty	Historical (unadjusted) 1967		1970		1972		1974	
	USMG/CMG	FMG	USMG/CMG	FMG	USMG/CMG	FMG	USMG/CMG	FMG
Total active physicians....	8,480	4,101	10,199	4,357	11,317	5,456	13,618 3/	5,216
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary care.....	28.6	31.3	30.5	31.8	34.4	32.8	43.9	33.5
General practice.....	1.1	4.1	0.5	2.1	0.3	2.4	0.2	2.7
Family practice.....	-	-	1.2	0.3	3.9	1.0	8.3	1.3
Internal medicine.....	20.0	17.5	21.6	19.3	21.6	20.4	26.4	18.4
Pediatrics.....	7.5	9.7	7.2	10.1	8.6	9.0	9.1	11.1
Other medical specialties.....	2.3	1.4	2.6	1.4	2.5	1.2	2.5	0.8
Dermatology.....	1.9	0.6	1.9	0.3	1.8	0.4	1.8	0.3
Pediatric allergy.....	0.2	0.1	0.4	0.4	0.4	0.3	0.3	0.2
Pediatric cardiology.....	0.2	0.7	0.3	0.7	0.3	0.5	0.3	0.3
Internal medicine subspecialties 1/	-	-	-	-	-	-	-	-
Surgical specialties.....	40.0	34.6	37.9	33.1	34.9	31.2	32.3	27.9
General surgery.....	18.9	19.7	16.5	19.1	14.5	18.8	13.2	16.0
Neurological surgery.....	1.0	0.8	1.1	0.8	1.0	0.8	0.8	0.3
Obstetrics and gynecology.....	5.8	7.1	5.3	7.2	5.7	6.8	5.5	5.5
Ophthalmology.....	4.3	0.8	4.3	0.6	3.8	0.6	3.5	0.7
Orthopedic surgery.....	4.2	1.6	4.7	1.2	4.2	0.9	4.0	1.2
Otolaryngology.....	2.2	0.5	2.0	0.6	1.7	0.8	1.7	0.8
Plastic surgery.....	0.6	0.6	0.9	0.6	1.0	0.6	1.1	0.7
Colon and rectal surgery.....	0.1	0.2	0.0	0.2	0.0	0.1	0.1	0.2
Thoracic surgery.....	0.8	1.4	0.8	1.0	0.8	1.0	0.7	1.0
Urology.....	2.1	1.9	2.3	1.8	2.2	1.3	1.7	1.5
Other specialties.....	29.1	32.6	29.2	33.8	28.0	34.7	21.3	37.8
Anesthesiology.....	4.0	6.7	3.3	8.0	2.9	8.6	2.7	6.7
Neurology.....	2.0	1.6	2.1	1.7	2.4	1.9	2.0	2.1
Pathology.....	3.9	9.1	3.2	9.6	3.1	8.1	2.9	7.9

TABLE 17

Specialty	Historical (unadjusted) 1967 USMG/CMG	1967 FMG	1970 USMG/CMG	1970 FMG	1972 USMG/CMG	1972 FMG	1974 USMG/CMG	1974 FMG
Forensic pathology.....	-	-	0.1	0.2	0.1	0.1	0.1	0.1
Psychiatry.....	10.0	9.6	10.3	7.7	9.1	8.0	7.0	11.7
Child psychiatry.....	1.5	0.6	1.3	1.0	1.6	1.2	1.4	1.9
Physical medicine and rehabilitation.....	0.6	1.4	0.3	1.5	0.4	1.5	0.2	1.8
Radiology.....	7.1	3.6	7.3	3.8	3.5	3.5	0.7	2.6
Diagnostic radiology.....	-	-	1.0	0.1	4.4	1.1	3.3	1.9
Therapeutic radiology.....	-	-	0.3	0.2	0.5	0.7	0.5	1.1
Miscellaneous 2/.....	-	-	-	-	-	-	-	-

1/ Includes gastroenterology, pulmonary disease, cardiovascular disease, and allergy.
2/ Includes aerospace medicine, public health, general preventive medicine, occupational medicine, "other", and unspecified.
3/ This total includes nuclear medicine (53-3%) and neuropathology (26-2%) not reported in the listing of specialties.

Source: Table 13 and Directory of Approved Internships and Residencies, AMA, Chicago. Yearly editions.

TABLE 17 (a)

Adjusted 1974; and projected (adjusted) 1975 and 1980

	Historical Adjusted		Projected (adjusted)			
	1974		1975		1980	
	USMG/CMG	FMG	USMG/CMG	FMG	USMG/CMG	FMG
Total active physicians.....	12,626	4,735	NA	NA	NA	NA
	100.0	100.0	100.0	100.0	100.0	100.0
Primary care.....	37.5	29.3	40.7	29.3	56.1	32.1
General practice.....	0.2	2.9	0.2	2.9	0.2	3.1
Family practice.....	9.0	1.4	10.7	1.6	19.4	2.6
Internal medicine.....	19.4	13.8	20.5	13.7	25.9	14.6
Pediatrics.....	9.0	11.2	9.3	11.1	10.6	11.8
Other medical specialties.....	9.1	5.6	8.9	5.6	6.6	5.9
Dermatology.....	2.0	0.3	1.9	0.3	1.4	0.3
Pediatric allergy.....	0.4	0.3	0.4	0.3	0.3	0.3
Pediatric cardiology.....	0.3	0.4	0.3	0.4	0.2	0.4
Internal medicine subspecialties 1/	6.5	4.6	6.3	4.6	4.7	4.9
Surgical specialties.....	26.0	19.7	24.7	19.4	19.6	14.5
General surgery.....	5.4	6.7	4.8	6.4	4.2	1.3
Neurological surgery.....	0.9	0.3	0.8	0.3	0.5	0.3
Obstetrics and gynecology.....	5.9	6.1	5.7	6.1	4.3	5.9
Ophthalmology.....	3.7	0.8	3.6	0.8	2.9	0.8
Orthopedic surgery.....	4.3	1.3	4.2	1.3	3.1	1.4
Otolaryngology.....	1.8	0.9	1.7	0.9	1.4	1.0
Plastic surgery.....	1.2	0.8	1.2	0.8	1.4	0.8
Colon and rectal surgery.....	0.2	0.2	0.2	0.2	0.1	0.2
Thoracic surgery.....	0.8	1.1	0.8	1.0	0.6	1.1
Urology.....	1.8	1.6	1.7	1.6	1.1	1.7
Other specialties.....	27.4	45.4	25.7	45.7	17.7	47.5
Anesthesiology.....	2.9	7.3	2.7	6.2	1.6	3.3
Neurology.....	2.0	2.3	1.9	2.3	1.4	2.4
Pathology.....	3.1	8.4	3.0	8.3	2.3	8.9
Forensic pathology.....	0.1	0.1	0.1	0.1	0.1	0.1
Psychiatry.....	6.1	10.4	5.6	11.3	3.1	13.5
Child psychiatry.....	1.5	2.1	1.5	2.1	1.1	2.2
Physical medicine and rehabilitation.....	0.2	2.0	0.2	2.1	0.1	2.4
Radiology.....	0.7	2.9	0.2	2.7	0.0	1.6
Diagnostic radiology.....	3.6	2.1	3.5	2.6	2.6	3.5
Therapeutic radiology.....	0.5	1.2	0.5	1.4	0.4	2.5
Miscellaneous 2/.....	6.7	6.7	6.5	6.6	5.0	7.1

1/ Includes gastroenterology, pulmonary disease, cardiovascular disease, and allergy.

2/ Includes aerospace medicine, public health, general preventive medicine, occupational medicine, "other", and unspecified.

Source: Table 13 and Directory of Approved Internships and Residencies, AMA, Chicago. Yearly editions.

TABLE 18

Active M.D.s by major specialty group:
Actual 1974; projected (Trend) 1975-1990

Specialty group	1974	1975	1980	1985	1990
	Number of active M.D.s				
Total.....	348,960	361,300	428,360	493,830	559,820
Primary care.....	133,590	138,280	176,440	216,760	257,730
Other medical specialties.....	18,480	19,600	24,240	28,880	33,610
Surgical specialties.....	98,670	101,370	111,610	121,640	131,300
Other specialties.....	98,230	102,050	116,090	126,570	137,190
	Percent distribution				
Total.....	100.0	100.0	100.0	100.0	100.0
Primary care.....	38.3	38.3	41.2	43.9	46.0
Other medical specialties....	5.3	5.4	5.7	5.8	6.0
Surgical specialties.....	28.3	28.1	26.1	24.6	23.5
Other specialties.....	28.1	28.2	27.1	25.6	24.5

Sources: 1974: see tables 11 and 14
1975-90: see text for methodology and assumptions.

Note : Figures may not add to totals due to independent rounding.

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TABLE 19

Supply of active M.D.s by specialty:
actual 1974; projected (Trend) 1975-1990

Specialty	Number				
	1974	1975	1980	1985	1990
Total active physicians....	348,960	361,300	428,360	493,830	559,820
Primary Care.....	133,590	138,280	176,440	216,760	257,730
General practice.....	47,570	47,120	44,470	40,940	36,890
Family practice.....	9,490	10,810	25,210	41,620	58,570
Internal medicine.....	54,680	57,160	75,230	94,400	113,950
Pediatrics.....	21,850	23,200	31,550	39,810	48,330
Other medical specialties.....	18,480	19,600	24,240	28,880	33,610
Dermatology.....	4,730	4,930	5,710	6,570	7,420
Pediatric allergy.....	450	510	760	1,000	1,260
Pediatric cardiology.....	560	610	790	940	1,110
Internal medicine sub-specialties 1/.....	12,730	13,550	16,990	20,380	23,840
Surgical specialties.....	98,670	101,370	111,610	121,640	131,300
General surgery.....	32,850	33,300	34,400	35,480	36,300
Neurological surgery.....	3,020	3,100	3,320	3,530	3,720
Obstetrics and gynecology...	22,180	22,870	25,510	27,840	30,130
Ophthalmology.....	11,350	11,700	13,230	14,900	16,530
Orthopedic surgery.....	11,610	12,050	13,810	15,670	17,500
Otolaryngology.....	5,900	6,090	6,890	7,700	8,500
Plastic surgery.....	2,210	2,370	3,400	4,500	5,620
Colon and rectal surgery....	700	730	780	830	870
Thoracic surgery.....	2,030	2,150	2,640	3,070	3,510
Urology.....	6,830	7,030	7,650	8,170	8,660
Other specialties.....	98,230	102,050	116,090	126,570	137,190
Anesthesiology.....	13,190	13,610	14,430	14,960	15,430
Neurology.....	4,060	4,340	5,490	6,540	7,620
Pathology.....	12,040	12,590	14,900	16,490	18,160
Forensic pathology.....	210	220	300	380	460
Psychiatry.....	24,620	25,470	28,230	29,780	31,360
Child psychiatry.....	2,550	2,790	3,790	4,690	5,620
Physical medicine and rehabilitation.....	1,700	1,790	2,2120	2,220	2,350
Radiology.....	12,260	12,240	11,640	10,740	9,710
Diagnostic radiology.....	3,260	3,770	6,060	8,290	10,630
Therapeutic radiology.....	1,130	1,240	1,850	2,270	2,730
Miscellaneous 2/.....	23,220	24,020	27,300	30,240	33,160

1/ Includes allergy, cardiovascular disease, gastroenterology, and pulmonary diseases.

2/ Includes aerospace medicine, general preventive medicine, occupational medicine, public health, unspecified, and "other specialties".

Sources: 1974: see Table 11.

Note : Figures may not add to subtotals and totals due to independent rounding.

TABLE 19 (a)

Supply of active M.D.s by specialty:
actual 1974; projected (Trend) 1975-1990

Specialty	Percent				
	1974	1975	1980	1985	1990
Total active physicians....	100.0	100.0	100.0	100.0	100.0
Primary Care.....	38.3	38.3	41.2	43.9	46.0
General practice.....	13.6	13.0	10.4	8.3	6.6
Family practice.....	2.7	3.0	5.9	8.4	10.5
Internal medicine.....	15.7	15.8	17.6	19.1	20.4
Pediatrics.....	6.3	6.4	7.4	8.1	8.6
Other medical specialties...	5.3	5.4	5.7	5.8	6.0
Dermatology.....	1.4	1.4	1.3	1.3	1.3
Pediatric allergy.....	.1	.1	.2	.2	.2
Pediatric cardiology.....	.2	.2	.2	.2	.2
Internal medicine sub-specialties 1/.....	3.6	3.8	4.0	4.1	4.3
Surgical specialties.....	28.3	28.1	26.1	24.6	23.5
General surgery.....	9.4	9.2	8.0	7.2	6.5
Neurological surgery.....	.9	.9	.8	.7	.7
Obstetrics and gynecology...	6.4	6.3	6.0	5.6	5.4
Ophthalmology.....	3.3	3.2	3.1	3.0	3.0
Orthopedic surgery.....	3.3	3.3	3.2	3.2	3.1
Otolaryngology.....	1.7	1.7	1.6	1.6	1.5
Plastic surgery.....	.6	.7	.8	.9	1.0
Colon and rectal surgery....	.2	.2	.2	.2	.2
Thoracic surgery.....	.6	.6	.6	.6	.6
Urology.....	2.0	1.9	1.8	1.7	1.5
Other specialties.....	28.1	28.2	27.1	25.6	24.5
Anesthesiology.....	3.8	3.8	3.4	3.0	2.8
Neurology.....	1.2	1.2	1.3	1.3	1.4
Pathology.....	3.4	3.5	3.5	3.3	3.2
Forensic pathology.....	.1	.1	.1	.1	.1
Psychiatry.....	7.1	7.0	6.6	6.0	5.6
Child psychiatry.....	.7	.8	.9	.9	1.0
Physical medicine and rehabilitation.....	.5	.5	.5	.5	.4
Radiology.....	3.5	3.4	2.7	2.2	1.7
Diagnostic radiology.....	.9	1.0	1.4	1.7	1.9
Therapeutic radiology.....	.3	.3	.4	.5	.5
Miscellaneous 2/.....	6.7	6.6	6.4	6.1	5.9

1/ Includes allergy, cardiovascular disease, gastroenterology, and pulmonary diseases.

2/ Includes aerospace medicine, general preventive medicine, occupational medicine, public health, unspecified, and "other specialties".

Sources: 1974: see Table 11.

Note : Figures may not add to subtotals and totals due to independent rounding.

in 1990 would be in primary care, as well as 32.1 percent of the 540 FMG residents, for a total of 10,470 positions. This is compared with the total 7,724 positions they occupied in 1974. Moreover, the inability to project losses according to specialty-specific age distributions results in a bias towards higher primary care projections.

The basic specialty projection and the illustrative projection show that in relation to population, primary care services as measured by the "marker" specialty supply will likely increase. The constant first-year residency illustration shows that the primary care M.D. to population ratio might be expected to increase from 63 per 100,000 in 1974 to 85 per 100,000 in 1990. The trend projection shows a greater increase, to 105 per 100,000 in the target year. In this latter trend projection, because of the magnitude of the aggregate supply projection, even the general surgeons exhibit a moderately constant physician to population ratio, falling only slightly from 15.5 per 100,000 in 1974 to 14.8 by 1990. In contrast, their numbers fall from 9.4 percent of all M.D.s in 1974 to 6.5 percent in 1990.

As a final note, "basic" projections of active D.O.s (now in development) show a rise from 13,551 as of December 31, 1974, to 14,100 in 1975, 17,700 in 1980, 23,300 in 1985, and 29,800 in 1990. While an estimated 45.1 percent of the D.O.s were in primary care in 1974 (see Table 2), trend projections of the future D.O. specialty distribution are not available from the Manpower Analysis Branch at this time.

PROJECTIONS OF THE SUPPLY OF PHYSICIAN ASSISTANTS AND NURSE PRACTITIONERS THROUGH 1990

The 1975 supply estimates for certificate and Masters nurse practitioners, physician assistants and Medex which include only those formally trained, were used as a base for the following projections. Similarly, the estimates for future entrants through 1990 consider only those in approved programs. Supply estimates for nurse practitioners were based upon data obtained by the State University of New York at Buffalo which included information on the number and types of nurse practitioner students and graduates between 1970 and 1975. Since essentially no formal training programs for nurse practitioners existed prior to this time these data should cover all active, formally trained nurse practitioners. Data on approved physician assistant training programs were provided by the AMA. Several considerations which have not been incorporated into the projection methodology due to lack of quantifiable measurements, are: the effect of changes in the reimbursement procedures; the effect of task delegation or the varieties of future health manpower, and the effects of entrants to the field as a result of equivalency and proficiency testing, from preparatory programs which are not approved, and from preparatory programs for other occupations, both approved and unapproved.

Methodology and Assumptions

The estimates for the number of formally trained physician assistants, Medex and nurse practitioners for 1975 were determined by counting the total number of graduates, or estimates thereof from the approved training programs through

June of 1975. The age and sex distribution of the active, credentialed supply was based upon survey data.(105)(106/) New entrants (graduates of approved programs only) were estimated for each year of the projection period. It was assumed that the sex distribution of the entrants would be similar to the sex distribution of the active supply. It was assumed that all physician assistant programs lasted two years, all certificate nurse practitioner programs one year, and all Masters degree nurse practitioner programs two years. Attrition rates for physician assistant programs were assumed to be 5 percent, for certificate nurse practitioner programs, 18 percent, and for Masters nurse practitioner programs, 36 percent based upon recent past experience.(107/)(108/) Similarly, it was assumed that the mix in the number of all physician extender programs would remain constant throughout the projection period.

Since the physician extender movement is largely sustained by the Federal Government, the future supply is particularly sensitive to changes in congressional mood. Thus, the following supply assumptions are based upon differing levels of Federal funding and estimates provided by individual program directors of future graduates in light of such funding. Utilizing these assumptions, three separate estimates were made: (1) it was assumed that Federal funding would continue at its present level through 1990; (2) it was assumed that Federal funding would be reduced as of 1980, resulting in the halving of the number of graduates in 1982; and (3) it was assumed that Federal funding would be increased in 1980, so as to triple the number of graduates as of 1982. Separations from the projected manpower pool for reasons of death, retirement, and temporary absence were estimated annually based upon survey data.(109/)(110/)(111/)

Projection Findings

In presenting these findings which are displayed in Table 20, it is essential to repeat the caveat that they relate only to formally trained physician extenders, and not to the total supply. Given the increased interest in training prerequisites, it can be assumed, however, that larger and larger proportions of the total active supply will have matriculated in aproved training programs. According to the findings displayed in this table, PAs and Medex will increase their numbers almost seven-fold, from 2,540 in 1975 to 18,520 in 1990, and certificate and Masters degree nurse practitioners will increase their number four-fold from 5,100 in 1975 to 23,030 in 1990. These estimates are based upon the assumption that Federal funding will be maintained at its current level through 1990. If Federal funding is tripled as of 1980, the total number of physician assistants and nurse practitioners in 1990 would be increased ten-fold and six-fold, respectively over the 1975 level, and if Federal funding is halved in 1980, the increase would be almost five-fold and three-fold, respectively.

(105/) Op. cit., Scheffler, R.M.
(106/) Op. cit., SUNY
(107/) Op. cit., Scheffler, R.M.
(108/) Op. cit., SUNY
(109/) Op. cit., Scheffler, R.M.
(110/) Op. cit., SUNY
(111/) Greville, T.M., Actuarial Advisor, NCHS, unpublished data.

TABLE 20

PRESENT AND PROJECTED SUPPLY OF PHYSICIAN EXTENDERS (PHYSICIAN ASSISTANTS AND NURSE PRACTITIONERS) 1975, 1980 and 1990

	1975	1980	1990		
			Basic	Low	High
TOTAL PHYSICIAN EXTENDER	7,640	18,840	41,550	29,040	57,590
Total Physician Assistants (PAs)	2,540	7,410	18,520	13,200	27,700
- Physician Assistants	2,100	6,550	16,640	11,790	26,440
- MEDEX	440	860	1,880	1,410	2,860
Total Nurse Practitioners (NPs)	5,100	11,430	23,030	15,840	29,890
- NP Certificate	3,800	8,270	15,680	11,140	20,210
- NP Masters	1,300	3,160	6,350	4,700	9,680

Source: Physician Assistants: Individual program director's estimates of 1974-1980 Enrollment.
Nurse Practitioners: SUNY. Characteristics of Trainees and Graduates of Nurse Practitioner Programs.

Note: Numbers may not add due to rounding.

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It is interesting to look at the current and projected supply of nurse practitioners in relation to the total numbers of registered nurses. Considering the fact that the 1975 supply of registered nurses equalled 758,000 FTE, nurse practitioners represented less than one percent of the total supply, and if compared to the projected supply of 1,246,700 FTE registered nurses in 1990, the projected supply of nurse practitioners (23,030) would represent only 1.8 percent.(112/)

Relation to Physicians and Their Projected Supply

When the projected numbers of physician extenders (29,040-57,590) for 1990, are compared to the projected supply of primary care physicians for 1990, (209,190-257,730) it can be seen that they will continue to represent only a small proportion of the total primary care manpower. Based on these data, the lowest projected numbers of primary care providers will be 238,230 and the highest projected numbers of primary care providers will be 315,320.

Based on service capacity measurements related to patient visits (see Table 9), an equivalency can be developed between physician extenders and primary care physicians, all other things being equal. The method derives from a 1975 study by Scheffler of a National sample of physician assistants in all types of practice settings. He found that one PA can increase the productivity of a primary care physician by 63 percent, as measured by office visits. Thus, if the total 1975 supply of PAs (2,540) is multiplied by this number (63 percent), they would be equivalent in service capacity to about 1,600 primary care physicians. The 1990 projected supply of 18,520 PAs would be equivalent in service capacity to about 11,700 primary care physicians.(113/). Similarly, if it is assumed that nurse practitioners will increase physician productivity by about 40 percent (an arbitrary estimate obtained by averaging the estimates displayed in Table 9), their 1975 supply of 5,100 would be equivalent in service capacity to about 2,000 primary care physicians, and their projected 1990 supply of 23,030 would be equivalent in service capacity to 9,200 primary care physicians.

Ramifications of Increasing Physician Supply

According to these projections, physician supply will continue its dynamic increase which began in the sixties and resulted from expanded medical school enrollments and removal of immigration restrictions. Efforts to expand the supply in the late 1960's were based on prevailing opinion that a physician manpower shortage existed. The expansion in physician supply has been so successful and the "pipeline capacity" for producing more physicians is so great that there is now an increasing concern about a potential oversupply of physicians. Logically, it could be assumed that oversupply would have several beneficial effects, namely improved health status and better distribution of physicians by specialty and by location. In fact these outcomes

(112/) Op. cit., The Supply of Health Manpower: 1970, Profiles and Projections to 1990.

(113/) Scheffler, R.M., The Productivity of Physician Assistants. Empirical Estimates, Presented at the Western Economic Association Meeting, June 1976.

and relationships have not been demonstrated. It is not clear how medical intervention relates to health status of populations but it does seem clear that environmental factors and personal lifestyles may have a more direct relationship to health status than consumption of greater volumes of physician services. Medical advances are approaching the point of limited returns in terms of increasing average life expectancies. Furthermore, despite the phenomenal growth in physician supply, specialty and locational disparities persist. In contrast, several symptoms of oversupply are now manifesting themselves, among which are escalating health costs, declining productivity and overutilization.

The conventional economic laws of supply and demand do not appear to apply to the utilization of physicians' services. Some analysts suggest that physicians can generate demand for their own services; thus, increasing physician supply calls forth greater utilization of their services and also derivative services such as X-ray, hospital bed and laboratory demands. Physicians have considerable control over the volume and mix of services delivered by other types of health personnel, also. This in turn increases the total and perhaps even unit cost of health services.(114/)(115/).

An oversupply of physicians may also displace other types of health manpower from their roles in the health care delivery system. Thus, physician extenders may not be utilized in the system despite their potential to reduce costs and augment physician productivity.

Physician surplus, when it exists, affects productivity of physicians and also physician extenders. Reduction in productivity is difficult to document in the absence of national and local statistics on the products or total outputs of physicians. Likewise, data on physicians' earnings as a function of the quantity of all services rendered are not available. What is available is limited information on surgeons' operative workloads in this country, and these data indicate lower productivity of U.S. surgeons, in general and by specialty, when compared to operative workloads of surgeons in other countries.(116/) However, these findings may be challenged because only operative workloads are being measured whereas U.S. surgeons may provide more non-operative services than their foreign counterparts. If physicians' productivity decreases, as reflected by reduction in operative workloads, there is concern that quality of care may be jeopardized because of lack of technical proficiency.

Another potential ramification of a physician surplus is the possibility of overutilization of services, such as unnecessary surgery. This is related to the issue of quality of care but in the absence of accepted norms and standards for required services, it is difficult to objectively identify "unnecessary" procedures in individual cases. Researchers are on firmer grounds, however, when comparing procedure rates among similar population

(114/) Reinhardt, U.E., Health Manpower Policy in the United States. Issues for Inquiry in the Next Decade. Bicentennial Conference on Health Policy, University of Pennsylvania, November 11-12, 1976.

(115/) Morrow, J.H., and Edwards, A.B., U.S. Manpower Policy. Will the Benefits Justify the Costs? Journal of Medical Education, 51, October 1976.

(116/) Op. cit., Nickerson, R.J.

groups. Wennberg, in a study of small area variations in operative rates in New England found marked differences in tonsillectomy, hysterectomy and cholecystectomy rates for similar populations. There appears to be a strong correlation between higher operative rates and larger numbers of surgeons. These findings lend weight to the contention than an overabundant supply of surgeons may result in excessivie or unnecessary surgery.(117/)

AREAS FOR FURTHER RESEARCH

In light of this discussion of supply and distribution of physicians and physician extenders, it is evident that more definitive information is needed in many of the areas we have explored. More comprehensive information will be of invaluable assistance in the formulation of policy regarding physician and physician extender manpower.

There is insufficient information available on medical specialty numbers, definitions, functions, and productivity. Information is also needed on the role of the physician extender, career patterns of physicians, the factors affecting specialty choice, and the optimal geographic distribution of physician specialists. The potential impact of national health insurance on the distribution by specialty and geography of physician specialist manpower also warrants further investigation.

One of the major problems facing policymakers is the definition of the word "specialist", because it is unclear which specific medical services should be and are included in the province of each specialty. As has been demonstrated, there is much overlap in service provisions among specialists, the magnitude of which varies according to the specialty. In an attempt to further understand specialists and their relationship to specific services, a large study on effort distribution of physicians is currently underway at the University of Southern California. The purpose of this study is to develop classification typologies for various provider specialty roles based on encounter characteristics. Using data collected from approximately 24 specialties, the contractor will classify the range of types of encounters per specialty.

Another unknown is the number of full-time equivalent physicians in each specialty; thus, the data bases for allopathic and osteopathic physicians need to be refined. As was shown earlier, a recent study attempting to equate full-time equivalency with head counts resulted in significant differences. In order to determine full-time equivalency, it is necessary to design instruments and collect data on the proportion of total effort devoted to direct patient care, learning, teaching, research and administration.

Little is known about how office based physicians distribute their time among primary, secondary and tertiary specialty care. Data from the Study of Surgical Services in the United States (SOSSUS) demonstrated that surgical services are provided by non-surgeons. In addition, primary care services are often provided by non-primary care physicians. A further analysis of utilization data collected by the National Ambulatory Medical Care Survey, the Health Interview Survey, and the University of Southern California Study will be helpful in defining specialty content. However, little light will

(117/) Op. cit., Wennberg, J.

be shed by these studies on the relationship between specialty content of practice, quality of care and the relationship of both to the medical school and residency curricula. More research is needed in these areas.

More information is urgently needed on career patterns in order to develop projections of physician specialty supply. Further determinations need to be made on the types and the magnitude of migrations of residents and active physicians from one specialty to another during training and active practice years. Both the Weiskotten and University of New Mexico longitudinal studies have provided some information on this subject.(118/)(119/)

The Study of Internal Medicine Training and Practice currently underway, sponsored jointly by the Federated Council of Internal Medicine and the Bureau of Health Manpower, will provide substantive information on specialty migration within internal medicine and its subspecialties and its relationship to training experiences and curricula. Studies such as these need to be undertaken for other large specialty groups. Further detailed examination of the AMA data base itself and data obtained from several comprehensive, longitudinal studies would also shed light on this subject. Determinations of the future physician specialist supply would also be improved by additional knowledge of the number and current and future roles of foreign medical graduates.

Although a considerable amount of work has been done in the area of physician specialty and geographic choice, the results are somewhat contradictory, warranting further research to support the development of sound policy. This would require an indepth, comprehensive, longitudinal assessment of specialty choice including: (1) personal attributes of the physician; (2) medical education experiences; (3) constraints on the profession; (4) community characteristics, and (5) family pressures.

A further area for research concerns the geographic distribution of physician specialists, physician extenders, associated health personnel and facilities. Hampering these determinations is the lack of an optimal geographic unit or area designation. Health Service Areas have been designated as the most rational local planning units as a result of the National Health Planning and Resources Development Act of 1974. The use of designated Health Service Areas as workable geographic reference and health market areas needs further investigation.

Several studies funded by the Bureau of Health Manpower are addressing the issue of adequate distribution of the individual specialties. For example, data on surgeon productivity and its relationship to biographic and training characteristics is being analyzed from the perspective of desired workloads, optimal numbers and mixes of the nine major surgical specialty groups, and the optimal geographical distribution by HSA type. On the basis of these analyses, the contractor will develop policy recommendations. Similarly, dermatologists are developing optimal estimates of dermatologist distributions at the HSA level. These estimates will be based on the prevalence of dermatologic disease, estimations of norms of care, and physician productivity.

(118/) Weiskotten, H.G., et. al., Trends in Medical Practice: An Analysis of the Distribution and Characteristics of Medical College Graduates, 1915-1950. Journal of Medical Education, 35:1070-1120, December 1960.

(119/) Otis, G.D., and Weiss, J.R., Patterns of Medical Career Preference. Journal of Medical Education, 48:1116,1125, December 1973, Part I.

Research on geographic location choices of physicians must continue in order to facilitate improvement in the distribution of medical personnel into shortage areas. This research must include an assessment of selection criteria underlying the desire to practice in a shortage area, an evaluation of the influence of training programs, and a practical understanding of institutional frameworks and linkages which can provide professional stimulation and referral services.

Finally, the role of physician extenders is still ambiguous and investigations need to be made as to their productivity and the relationship of that productivity to practice setting and to physician and patient characteristics. Furthermore, little is known as to their potential for ameliorating present uneven distribution of primary care services because their utilization is so closely related to direct physician supervision. In addition, the predilection of physician extenders for choosing underserved areas for practice is not fully known. Other unknown aspects of physician extender utilization are the quality of care they render in the many possible settings in which they are used; the impact of altering reimbursement procedures on their utilization; and the possible effects of National Health Insurance on the costs of and demands for physician extenders.

POLICY ISSUES AND OPTIONS

Policies, strategies and priorities which impact on the supply and distribution of physicians and physician extenders have to be developed. Short and long range health manpower planning is essential to address the issues which have been identified in this paper. Five major issues confront policymakers in regards to the distribution of physician supply by specialty. These are: (1) the establishment of National goals and priorities regarding levels of health status; (2) defining an acceptable or adequate supply and mix of physicians by specialty, and their relation to the role of the physician extender; (3) the establishment of acceptable geographic distribution of physicians by specialty; (4) developing the means to influence the specialty choice and geographic distribution of physicians; and (5) developing the mechanisms to assure access to health services.

The establishment of national goals and priorities regarding acceptable indices of health is necessary before adequate decisions on the acceptable distribution of medical specialty manpower can be made. Thus, manpower requirements should be derived from an estimation of the volume of human needs which exist and can be addressed by physicians and physician extenders. This volume of needs will, of course, depend upon what standards are established. For example, if prevention and/or equality of access were established as goals, the distribution and utilization of certain types of health services and/or manpower would be affected significantly. While the development of a national health strategy is relevant to this issue, it is beyond the scope of this paper.

Central to the issue of specialty distribution is the adequacy of the data upon which policy decisions are based. Currently, very little information is available about the actual services being provided by different types of self-designated specialist physicians and physician extenders. However,

the National Ambulatory Medical Care Survey and the ongoing Physician Specialist Practice Profile Survey continue to yield information on this subject. With the American public spending $139 billion on health care in fiscal year 1976, accurate data on the manpower largely responsible for these expenditures should be available and accessible to the public.

The second issue relates to the adequacy of the supply and mix of physicians by specialty and the supply and utilization of physician extenders. The assertion of an uneven distribution of physicians implies knowledge of a more appropriate distribution. At present, the technology is meagre and there is insufficient information available to derive a generally acceptable distribution. Furthermore, little is known about the impact of an increasing supply of physician assistants and nurse practitioners on distribution of physicians. In recognition of this, improved planning techniques and resources should be developed for use at the local level to identify and translate service requirements into corresponding health manpower requirements. Ultimately, a combination of local determinations with independently assessed national requirements could provide a baseline for determining adequate specialty and physician extender supply and distribution. It is hoped that the National Health Planning and Resources Development Act, (P.L. 93-641), which is to be revised in the coming year, will provide a means to accomplish this goal.

The continued unequal distribution of physicians by specialty has major policy implications. Shortages of some specialties in some service areas may severely curtail realistic options for national health insurance. The assurance of access to health services, even under the current system, requires a rationalization of the distribution of resources. Therefore, it is necessary to assure that there is a system in operation to continuously analyze physician supply and requirements and to translate them into preferred schemas for the allocation and financing of training opportunities.

At present, our analytic capabilities are not sufficient to fine tune adjustments on projections of the future supply of specialty manpower. This does not preclude using the available evidence, though subjective in many cases, for policymaking. For example, it is generally believed that the availability of primary care manpower is insufficient. However, prior to making determinations as to the magnitude of the shortage, decisions have to be made as to what the role of physician assistants and nurse practitioners should be, and whether or not their supply should be increased, and if so, what effect this would have on primary care physician supply, utilization, and training requirements. Whatever the magnitude of the shortage, decisions have to be made regarding the appropriate Federal action.

The third issue concerns the geographic location of physicians and physician extenders in practice. This issue is even more complex at the national level than the basic issue of specialty distribution. Increasing the supply of physicians does not by itself ameliorate geographic maldistribution, assuming that the same factors leading to the present distribution continue to operate. Thus, those specialties which have significantly unfavorable geographic distribution patterns, e.g., psychiatry, may require an increase in supply to overcome maldistribution but only on a targeted basis. At the same time, however, the use of alternative manpower resources such as masters level counselors and psychologists, must also be explored.

Programs and policies designed to remedy uneven physician distribution by geography and specialty already exist and will likely be expanded in the area of graduate medical education. This is an ideal place to affect the kind of physicians produced because this is where the community, the health care system, and the practitioner come together. Furthermore, graduate education is in large part the key to specialty and to some extent geographic distribution. Consequently, any serious attempt to remedy or modify specialty distribution must also address the distribution of training opportunities, in addition to the content and financing of training programs. The financing of graduate medical education, particularly primary care training in ambulatory settings, is a crucial problem awaiting solution. This is the subject of another paper in this series for the Graduate Medical Education National Advisory Committee.

The fourth issue relates to the means by which a more equitable distribution of physicians both by specialty and by geography can be affected. Previous discussion of the literature led to the conclusion that further research must be conducted before a sound policy can be developed in regard to specialty and geographic location decisions of medical recruits. Once this is better understood, assessments can be made as to the relative payoff potential of policies which would: (1) develop selection criteria to aid in identification of individuals who are more likely to choose primary care and shortage area locations; (2) increase special training resources to develop skills in primary care and influence students to select primary care and shortage area practice; or (3) a combination of the above.

The fifth issue concerns access which is only partially related to the available supply and mix of physician specialists. Access, defined simply, is a measure of the ease or difficulty with which all individuals obtain basic health care services. Access can be measured in terms of the effort expended by patients and their degree of success in obtaining care; thus, it is a dynamic concept involving the seeking and obtaining of care. On the other hand, availability is a static concept which relates to types of services in existence, hours during which these services are offered, and the transportation system linking care seekers and care providers. In terms of meeting demand for health services, availability is a characteristic of the structure, but accessibility is a characteristic of the process. The factors and combinations thereof which facilitate or impair access include financial, geographic, education, sociocultural and organizational considerations. Depending upon the particular population considered, any, one, or all of these factors play varying roles in the process of health service seeking and utilization. For this reason, equitable access will not be achieved by a uniform strategy for all "underserved" populations. In the past, Federal, State, and local efforts primarily have been focused on decreasing the financial and geographic access barriers, with varying amounts of success. The other barriers, namely those of an educational, sociocultural and organizational nature are more subtle in nature and more difficult to overcome through policies targeted at or emanating from the health system alone. Clearly, greater interdisciplinary efforts and interagency planning will be needed to improve access in these circumstances.

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